

DEFENSE INDUSTRY BULLETIN

Volume 1 No. 9

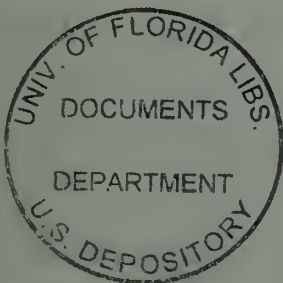
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DEPARTMENT OF DEFENSE



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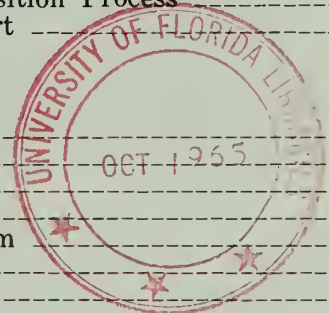
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Sealab II



SEALAB II, the second phase of the Navy's "man-in-the-sea" program, begins as an undersea laboratory is submerged off the coast of Southern California.

While submerged at a depth of 210 feet, the 57-foot habitat will be occupied by three 10-man teams consisting of both Navymen and civilian scientists. Each group will remain submerged for 15 days at a time.

The teams will conduct experimental salvage operations, marine biological studies and oceanographic research projects. Personnel will also be given a series of physiological performance tests.

The 45-day undersea experiment, longest of its type yet attempted, began Aug. 26 under the sponsorship of the Office of Naval Research. The first phase of SEALAB was conducted last year near Bermuda and lasted 11 days. (See article on Navy Deep Submergence Program on page 1.)



Why Vietnam

In the foreword to "Why Vietnam" reprinted below, President Johnson introduces a report of vital significance to all Americans. Published in magazine form, "Why Vietnam" is available from the Superintendent of Documents, U.S. Government Printing Office, Washington, D. C. 20402, at a price of 30 cents.

My fellow Americans:

Once again in man's age-old struggle for a better life and a world of peace, the wisdom, courage and compassion of the American people are being put to the test. This is the meaning of the tragic conflict in Vietnam.

In meeting the present challenge, it is essential that our people seek understanding, and that our leaders speak with candor.

I have therefore directed that this report to the American people be compiled and widely distributed. In its pages you will find statements on Vietnam by three leaders of your Government—by your President, your Secretary of State and your Secretary of Defense.

These statements were prepared for different audiences and they reflect the differing responsibilities of each speaker. The congressional testimony has been edited to avoid undue repetition and to incorporate the sense of the discussions that ensued.

Together, they construct a clear definition of America's role in the Vietnam conflict:

- the dangers and hopes that Vietnam holds for all free men
- the fullness and limits of our national objectives in a war we did not seek
- the constant effort on our part to bring this war we do not desire to a quick and honorable end.

Lyndon B. Johnson

Navy to Reactivate Thirty-Nine Ships and Landing Craft

Twenty-three ships and 16 landing craft in the U.S. Navy and National Defense Reserve Fleets will be activated to meet increased requirements resulting from current operations in Southeast Asia.

The 39 ships and other units scheduled for activation and the Reserve Fleet from which they will come are:

Fleet Oiler TAPPAHANNOCK (AO-43)—National Defense Reserve Fleet, Beaumont, Tex.

Attack Cargo Ship VIRGO (AKA-20)—National Defense Reserve Fleet, Olympia, Wash. To be activated as an ammunition ship (AE).

Attack Cargo Ship CHARA (AKA-58)—National Defense Reserve Fleet, Astoria, Ore. To be activated as an ammunition ship (AE).

Seventeen Tank Landing Ships (LST's)—Six from the Atlantic and 11 from Pacific Reserve Fleet.

Three Gasoline Tankers (AOG's)—One from the Atlantic and two from the Pacific National Defense Reserve Fleet.

Sixteen Utility Landing Craft (LCU's)—Taken from both Pacific and Atlantic Navy Reserve Fleets.

When activated, all vessels will be assigned as units of the U.S. Pacific Fleet. Decisions regarding the assignment of private and Navy shipyards to conduct the activations are expected in the near future.

DEFENSE INDUSTRY BULLETIN

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The purpose of the *BULLETIN* is to serve as a means of communication between the Department of Defense (DOD) and its authorized agencies and defense contractors and other business interests. It will serve as a guide to industry concerning official policies, programs and projects, and will seek to stimulate thought by members of the defense-industry team in solving the problems that may arise in fulfilling the requirements of the DOD.

Material in the *BULLETIN* is selected to supply pertinent unclassified data of interest to the business community. Suggestions from industry representatives for topics to be covered in future issues should be forwarded to the Business & Labor Division.

The *BULLETIN* is distributed each month to the agencies of Department of Defense, Army, Navy, and Air Force, and to representatives of industry. Request for copies should be addressed to the Business & Labor Division, OASD/PA, Room 2E813, The Pentagon, Washington, D.C. 20301, telephone, OXford 5-2709.

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The Deep Submergence Rescue Vehicle

by

Samuel Feldman

Head, Deep Submergence Vehicle Program
U. S. Navy Special Projects Office

In the past year, the Navy has taken a major step forward towards opening the door to the Inner Space of the Oceans. As the SPUTNIK event launched the United States into its vast space program, so it was that the unfortunate THRESHER disaster sparked and revitalized the Navy's interest in the ocean depths.

Shortly after the THRESHER went down with 129 men aboard in April 1963, the Secretary of the Navy established the Deep Submergence Systems Review Group (DSSRG) under Rear Admiral E. C. Stephan, USN (Ret.), to examine the Navy's capabilities for deep ocean rescue, search and recovery. After a thorough review, the DSSRG found that the Navy's capability to work in the deep ocean medium was extremely limited, and that had the THRESHER bottomed at her collapse depth, with hull intact, our existing rescue systems would have been inadequate.

As a result of recommendations of the DSSRG study, the Chief of Naval Material established the Deep Submergence Systems Project (DSSP) under the Director, Special Projects. In compliance with Specific Operational Requirements and Advanced Development Objectives issued by the Chief of Naval Operations, the DSSP program has been divided into four major elements:

I. Submarine Location, Escape and Rescue

Location. Provide the capability to locate a distressed submarine and retrieve data to assist investigators in determining the cause and nature of the casualty. Aids to investigation will be installed on all United States combatant submarines and will include such items as pingers, data capsule buoys and tethered radio buoys. Installation of these equipments will be phased with the normal overhaul cycle of the submarines.

Escape. A three-part program to improve the present submarine escape capability is planned:

- To increase the possibilities for survival of escaping personnel, immersion suits and one-man life rafts will be procured. These equipments will be purchased in sufficient quantity to provide suits and rafts for 110% of the submarine crew complement in each of the submarine's two escape compartments. The initial procurement will be completed during FY 1967.

- Free ascent escape will be improved by providing submarine personnel with more frequent training and by progressively increasing the training requirement from the present 50-foot ascents to a planned depth of 200 feet. Initially, a select group of trainees will receive 100-foot escape training and the effectiveness of this training studied and evaluated. Upon the successful conclusion of these studies, implementation of a 200-foot escape training program will commence.

- Open sea ascent, from depths up to 600 feet, will be conducted in FY 1969 to demonstrate the feasibility of emergency exit from a disabled submarine at greater depths.

Rescue. A new rescue system is being developed to permit the rescue of surviving submarine personnel under all weather conditions, under ice and at depths as great as submarine collapse depths. The overall rescue system will include three units, each unit containing two submersibles, a surface support ship and associated equipment. In order to provide rapid response to a disaster anywhere in the world, the rescue vehicle will be designed to be air transportable and will be carried to the scene of operations aboard a nuclear submarine in a "piggy-back" fashion. Each vehicle will have a crew of three men and be capable of transferring 12-14 survivors on each trip from the disabled submarine to the "mother" submarine.

II. Search and Small Object Recovery

Presently, more than 80% of the ocean volume lies beyond the reach of Navy operating capabilities. The development of this system will permit survey, investigations and recovery of small objects from depths to 20,000 feet—about 98% of the ocean floor. To evaluate technical concepts, a 6,000-foot search test vehicle will be constructed to be followed by two 20,000-foot operational search units. Each unit will be composed of two submersible vehicles and an associated surface vessel with support and checkout equipment. These units will provide the Navy a two-ocean, deep sea search and retrieval capability.

III. Man-in-the-Sea

The Man-in-the-Sea Program is aimed at extending man's capability of working under water—at greater depths and for longer durations of time. More specifically, the objectives of this part of the program are to perform the following types of work at continental shelf depths:

- Locate, identify and describe conditions of distressed submarines.
- Effect rapid and efficient submarine rescue and escape.
- Carry out underwater salvage and construction.
- Recover or neutralize objects of military importance.
- Inspect, maintain and repair underwater emplacements.
- Research, explore and exploit the continental shelf.

This program will provide man the capability of living and working in the deep sea environment at ambient pressure rather than at normal atmospheric conditions.

It is ultimately planned to extend this diving capability down to the physiological limits of man—which is now estimated between 600-1,000 feet.

IV. Large Object Salvage

Provide the capability to recover large objects, including sunken ships, requiring a deadweight lift of up to 1,000 tons from continental shelf depths (approximately 600-800 feet). To accomplish this mission, external lift will be supplied primarily by new sets of collapsible pontoons with a combined buoyancy of 1,000 tons. Underwater work will be accomplished by divers equipped with the appropriate tools and devices. The medical and physiological research and development required for

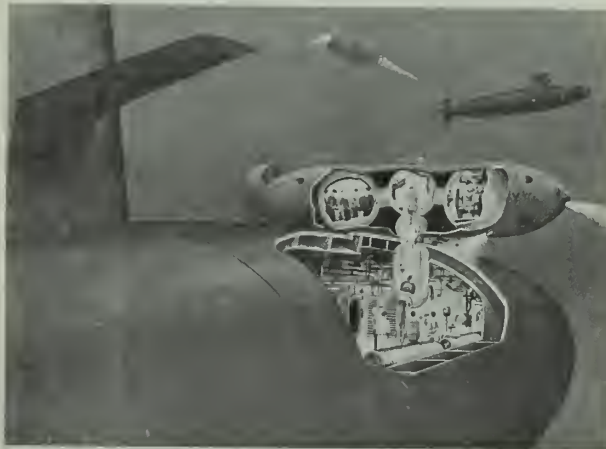


Figure 1.

safely conducting deep diving work will be provided by the Man-in-the-Sea Program. Additionally, feasibility studies and prototype development will be conducted to resolve the problems associated with salvage operations at submarine collapse depths and provide buoyancy for an external lift of 1,000 tons. Investigation, object preparation and rigging will be done by a manned submersible vehicle developed under the Rescue or Search Program. This system, with surface support equipments and vessels, will introduce a totally new salvage capability within the fleet.

The Rescue and Search Systems involve the development of two radically new small deep submersible vehicles. The rescue vehicle will have a depth range of about 6,000 feet and will be capable of rescuing personnel from a disabled submarine down to its collapse depth. The search vehicle will have a depth capability of 20,000 feet and be equipped with advanced search and manipulator devices to accomplish undersea work.

I shall describe herein the rescue vehicle for which a design and fabrication contract will be awarded in late 1965. We have recently issued a Request for Proposal soliciting from industry technical proposals for the design, fabrication, assembly and evaluation of the first prototype rescue vehicle.

The primary mission of the Rescue System is to rescue personnel from a sunken submarine in as rapid a response time as possible. In order to meet this mission, we have established an operational goal for providing an all-weather capability in which rescue operations could be accomplished within 24 hours of a distress signal alert. Because of the limitations imposed by surface sea conditions on the present Auxiliary Submarine Rescue Ship (ASR)—McCann Chamber system, it was decided that the complete rescue system be capable of operation totally submerged. This not only removed the free surface as a constraint but would also permit rescue operations under the ice.

In order to achieve this rapid response time, all-weather capability, we are designing a vehicle which will be both air-transportable and capable of piggy-back transport on a mother submarine. In a typical mission sequence, the following procedure may be used:

1. Disabled submarine releases a distress alert.
2. Upon receipt of distress signal, the nearest rescue unit is alerted.
3. The rescue vehicle is transported to airfield on a special trailer truck.
4. The vehicle and special pallet is loaded in a C-141A aircraft and flown to an airport nearest the port of disaster.
5. The vehicle is trucked to the nearest port for off-loading onto either a surface craft or mother submarine.
6. The support ship (surface or submarine) will proceed to the disaster area and launch the rescue vehicle.
7. The rescue vehicle will proceed to the sunken submarine and mate to the escape hatch.

8. Personnel will be transferred to the rescue vehicle and transported to the mother ship. Repeat trips will be made as required to complete the rescue operation.

A preliminary design has been completed on the rescue vehicle, resulting in the following characteristics:

- Length: 42 feet.
- Diameter: 8 feet.
- Weight: 50,000 pounds.
- Depth: 3,500 feet.
- Speed: 5 knots maximum, 3 knots for 12 hours.
- Personnel: 3 crew, 12 rescues.

Figure 1 shows an artist's concept of the rescue vehicle; Figures 2 and 3 show a preliminary arrangement of major hardware and external sensors, such as sonar, lights, television, etc.

There were two major considerations which dictated the concept and configuration finally selected: the material, size and shape of the manned pressure capsule; and the type of propulsion system.

A number of pressure hull configurations were closely studied, including a single sphere, double interconnected spheres, a cylinder and, finally, the triple sphere concept adopted. An intensive study was also made of alternative materials such as high-strength steels, titanium and aluminum. Of prime consideration in making a choice of pressure capsule were the following factors:

- Structural strength.
- Internal space available.
- Internal and external arrangements.
- Weight/displacement ratio.
- Material fabricability.
- Flexibility for secondary missions.
- Air transportability.

The three-sphere concept chosen for the rescue vehicle provides an excellent mating bell location, requires no disassembly prior to air transport, permits a very desirable internal arrangement, provides compartmentation for operator safety during the rescue mission and further allows more flexibility for secondary missions, i.e., Man-in-the-Sea support, oceanographic explorations, etc.

Although titanium would provide a better weight-displacement ratio, HY-140 was selected for the pressure hull because it offers a higher confidence level in ability to fabricate the vehicle within our time schedule.

The selection of a propulsion and control system is perhaps the most critical factor in achieving the highly maneuverable vehicle required for the rescue mission. The underwater mating of the rescue vehicle with the sunken submarine is a difficult problem, to say the least. It requires precise control at zero speed in the presence of currents and other flow irregularities, plus the ability to establish a leak-proof seal between the two vehicles. In effect, we are attempting to develop an underwater helicopter capability of hovering over our points of interest.

An intensive study of alternative propulsion systems was made on:

(Continued on page 18)

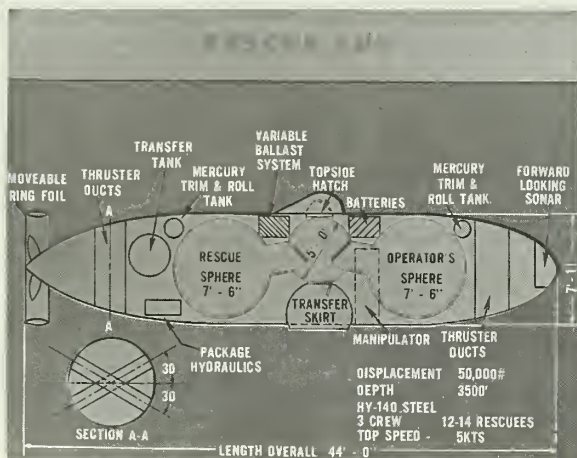


Figure 2.

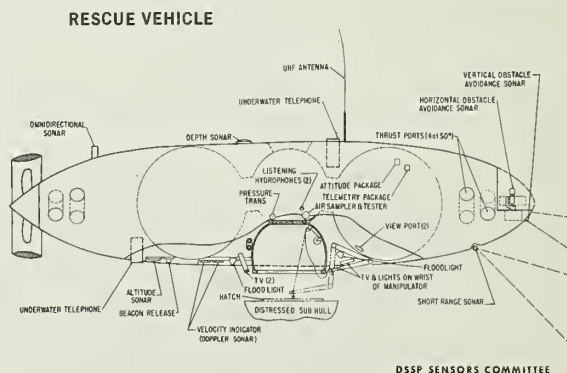


Figure 3.

The Requirement For Aerospace Propulsion Test Facilities

by

Brig. Gen. Lee V. Gossick, USAF

Commander, Arnold Engineering Development Center
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Brig. Gen. Lee V. Gossick,
USAF

Man's progress in flight has been governed essentially by the performance, efficiency and reliability of the propulsion systems he has developed for his aircraft, missiles, satellites and spacecraft.

This does not imply that the aerodynamic, materials, structures, chemistry and electronic scientific disciplines are not important; but, rather that propulsion requirements are frequently the pacing technology.

Aerospace Progress Depends on Propulsion

Wilbur and Orville Wright solved their basic aerodynamic problems in wind tunnels and with gliders, but their first powered flight had to wait until they developed a lightweight engine that could sustain flight of the catapult-launched Wright Flyer.

Today, there are many critically important technical disciplines which confront us. They include development and reliable launch and recovery systems for spacecraft and satellites, improved re-entry vehicles, low-altitude supersonic and hypersonic vehicles and practical and dependable VTOL and STOL aircraft, to name only a few.

However, our success or failure in developing these types of aerospace craft will depend largely upon the availability of the advanced propulsion systems they require.

Because of the great emphasis on development of ballistic missiles, satellites and spacecraft during the past decade, the manpower and money allotted to the challenge that still confronts us in achieving improved flight within the earth's atmosphere has been assigned a lower priority.

The late Dr. Theodore von Karman expressed his concern with this oversight several years ago. He pointed out that we still have a long way to go in attaining optimum use of the earth's atmosphere to develop much more efficient air-breathing propulsion systems.

General Bernard Schriever, Commander of the Air Force Systems Command, emphasized the need for emphasis on propulsion development in the June 1965 issue of the *Defense Industry Bulletin* ("The U.S. Air Force Interest in Advanced Propulsion"). He said that propulsion is "a pacing area of technology, in the development of new aeronautical and space vehicles, as well as the true aerospace vehicles which are versatile enough to operate efficiently both within and outside the earth's atmosphere."

Propulsion Progress Depends on Facilities

There is an important corollary to General Schriever's statement. If propulsion is a pacing factor in aerospace progress, adequate propulsion ground test facilities are, in turn, the pacing factor for propulsion progress.

This, I believe, is an important fact which is frequently overlooked.

The air-breathing turbojets and ramjets, the solid and liquid propellant rockets and the electric propulsion devices of the future must be developed primarily in large supersonic propulsion wind tunnels, high altitude engine test cells or space simulation chambers capable of simulating the wide range of flight environments they will encounter in flight.

Ground Testing Advantages

During the past five years, there has been a significant increase in ground testing propulsion systems. This has been directed by the requirement to stay abreast of the development of new aerospace vehicles. This trend also illustrates the growing recognition of the advantages in testing an engine in a realistically simulated flight environment before committing it to actual flight.

However, besides the obvious opportunities to save substantial amounts of development time and money, there are a number of other important advantages in ground testing that are not as widely recognized. For example:

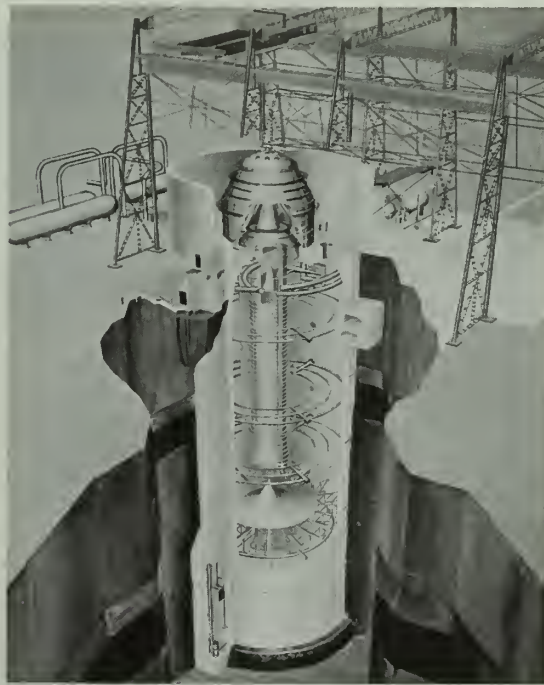
- Precise measurements, more accurate than those which can be computed in actual flight, may be obtained by means of a carefully instrumented test stand.

- A larger volume of test data can be obtained. Several hundred instrumentation lines attached to the test unit can provide a considerably greater volume of data than could be obtained by telemetry links with a vehicle in actual flight.

- Direct close-up observation of the test item by means of high-speed cameras and video monitors is a valuable advantage when unexpected phenomena or failures are encountered and, in the event of a failure, the damaged test item is available for post-fire examination.

- Specific conditions can be re-created with a much higher degree of precision than is possible in actual flight. Test conditions have a high degree of "repeatability."

- Random excursions or instabilities in thrust vectors can be detected and measured with a high degree of precision. This is particularly important in solid-propellant



World's largest altitude test cell for test firing rocket engines up to 500,000 pounds of thrust. This Propulsion Engine Test Cell (J-4) is part of the Rocket Test Facility at the Air Force's Arnold Center. The exhaust gasses are captured by an underground chamber 250 feet deep and 100 feet in diameter.

rocket motors. In some cases, it is also important to measure deviations in the thrust vectors while the motor is spun on the thrust stand.

Typical Test Problem

These generalized advantages cover relatively broad areas of investigation within which there is a myriad of problems which may be considered as typical of propulsion tests in flight simulation laboratories. To mention a few examples: "chuffing" or residual thrust after the prescribed burnout of a solid-propellant rocket motor; destructive base heating resulting from the recirculation of exhaust gases in the clustered nozzles; failure or an uncooled nozzle extension in a simulated high-altitude environment; ignition failure in an ultra-high altitude environment; prohibitive inlet distortion in a turbojet or ramjet at certain attitudes at various altitudes and velocities; combustion or structural instabilities in various modes of operation; failure to achieve a re-start in a turbojet at certain velocities and altitudes; unexpected arcing in an ion-engine package when subjected to rapid, transient low pressure conditions simulating decompression when ejected from a protective shroud.

Propulsion Test Objectives

Simply stated, the testing of propulsion systems in ground test facilities is basically concerned with determining the effects of altitude, velocity and temperature on the engines and their components. More specifically, the major points of testing in propulsion ground test facilities are:

Turbojets and Ramjets. Determining inlet-engine compatibility; documenting design performance in preliminary flight rating tests; determining combustion and thermal characteristics, nozzle exit conditions and structural adequacy at critical flight conditions; investigating the adequacy of automatic or manual control systems.

Rocket Motors. Determining performance—measuring thrust and impulse; documenting nozzle reliability, efficiency and durability; investigating thermal characteristics; determining ignition, mixing and combustion characteristics; and investigating certain dynamic effects as spinning, staging, acceleration and vibration.

Electric Propulsion Devices. Determining general performance and adequacy of controls, investigating the effect of high-vacuum environments and of thermal loads imposed by solar radiation and the heat sink of space; determining the interactions of adjacent systems and components.

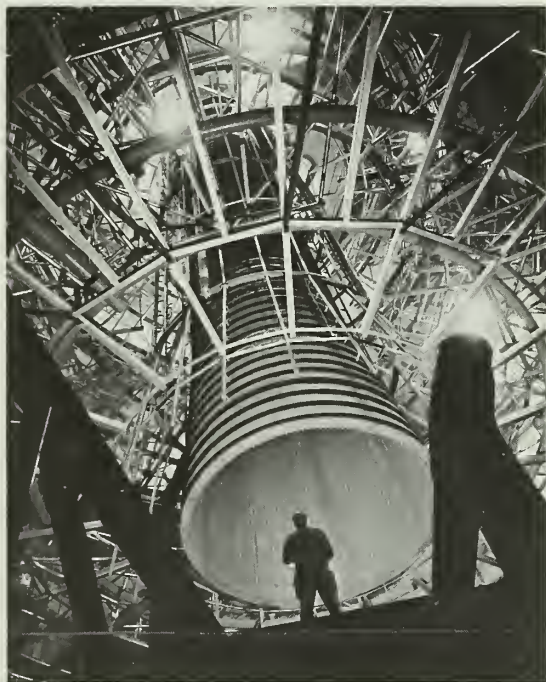
Major Advances Required

During the past 20 years, propulsion technology has advanced at an extremely rapid rate. It has been a quick, long step from the reciprocating engines of World War II, to the turbojets and ramjets, the rocket engines and practical electric space propulsion.

During the next decade, advances in aerospace programs will depend upon major advances in propulsion technology—and in the scientific disciplines embraced by the technology such as materials, fuels, structures and electronics. The goal of developing such major systems as the supersonic transport, hypersonic manned aircraft, recoverable space boosters and a variety of advanced space and satellite systems can be translated into real requirements for such propulsion systems as the high-pass turbojet, the supersonic burning or combustion ramjet commonly identified as "Scramjet," perhaps a practical dual-cycle engine which can make the transition from turbojet to ramjet and an array of reliable, highly efficient electrical propulsion devices and chemical rocket motors.

Development of these advanced propulsion systems—the ones that will be required in the 1970-1980 period—is going to require a new generation of ground test facilities. These facilities require a long time to plan, design, fund and build, due to the complex technologies involved. Without advances in ground test facilities, progress in the field of aerospace propulsion will be jeopardized.

To insure the most rapid and economical development of future aerospace systems, we must take immediate steps to insure that adequate ground test facilities for propulsion systems are planned, designed, funded and built without delay.



Underground exhaust chamber. Almost 200 feet below ground level, a test crewman looks up at the diffuser, which captures exhaust of rocket engines having up to 500,000 pounds of thrust, being tested in the largest of ten high altitude test cells at the Air Force's Arnold Center.

Army Will Activate New Division and Three Separate Brigades

The U.S. Army will activate an infantry division of about 14,000 men and three brigades consisting of about 3,800 men each by early 1966.

Plans call for one brigade to be organized at Fort Devens, Mass., in October 1965, another at Fort Campbell, Ky., in January 1966 and the third at Fort Benning, Ga., in February 1966. Each brigade will consist of three infantry battalions, one artillery battalion and other support, command and control units.

The new division will be activated in December of this year at a location to be announced later. Designations of all the new units will also be announced later.

Each of the new units will be built around a nucleus of experienced officers and non-commissioned officers drawn from other elements of the active Army. The balance of the unit's strength will be made up of newly enlisted or inducted men.

Personnel of the division, and the brigade to be activated in October, will be given basic combat training and advanced individual training in the units rather than at Army training centers. Men to be assigned to the remaining brigades will be put through the training centers and will have completed basic and advanced individual training by the time they report to their brigades. This system will provide for the simultaneous training of the greatest possible number of men during the time the Army is expanding the capacity of its training centers.

Defense Contract Audit Agency Assumes Control Of Contract Audit Operations

Effective July 1, 1965, the Defense Contract Audit Agency (DCAA) assumed technical control over all Department of Defense contract audit operations. Planning for the take-over was initiated in January of this year following Secretary McNamara's decision in December 1964 to consolidate the contract audit organizations of the three Military Departments and establish the new agency.

The DCAA's assigned mission is the performance of all necessary contract auditing for the Department of Defense and the Military Departments and, in so doing, to provide accounting and financial advisory services as required in connection with the negotiation, administration and settlement of contracts and subcontracts. DCAA will also provide contract audit service to other Government agencies where arrangements for such service are made.

Contractors are, of course, interested in knowing what impact the new agency will have on them. Mr. William B. Petty, director of the agency, has advised that it is his intention and objective to make this impact as light as possible and that every effort will be made to operate in a manner which will be constructive and beneficial.

Substantial benefits are calculated to accrue both to the Government and to its contractors by reason of the consolidation. What are the benefits that may accrue to contractors? Following are some examples which come to mind.

Promptness of Audit Service. The total DCAA audit personnel complement is understandably much larger than the contract audit staff of any one of its predecessor organizations. This condition will permit better deployment of the total audit staff in the interest of more timely audit service. Consolidation of contract audit has also eliminated the need for numerous interagency requests for assist audits which operated to lengthen the time frame for completing many audits.

Continuity of Audit Cognizance. With the activation of the DCAA, there is no longer any need for tri-service audit coordination at a contractor location. Audit coordination was a technique used by the departmental audit services to avoid multi-service audit at the same contractor location. The audit service of the department with total dollar preponderance of auditable contracts would be assigned the responsibility for all required audit work regardless of whether it was for the Army, Navy, Air Force, or other Government office. The system had much to recommend it. However, it resulted in some problems to contractors when audit cognizance changed from one audit service to another.

Uniformity of Audit Approach. Operating as separate, autonomous entities, the departmental contract audit services could not avoid developing shades of difference in audit approach. Cumulatively, the differences became most marked upon change of audit cognizance at a contractors location from one of the departmental audit agencies to another. On such an occasion it became necessary for contractor personnel to adjust to the requirements of the incoming audit service while "unlearning" the requirements of its predecessor. Areas where differences among the audit services were apt to exist included details of audit procedures, format and content of audit reports and, in some cases, audit views as to acceptability of specific cost items. This will no longer exist under DCAA. Uniform audit and reporting procedures will apply across the board to all DCAA audits. The best features of predecessor Army, Navy and Air Force instructions and procedures will be utilized.

Effectiveness of Communication. Activation of DCAA as the sole contract audit organization within the Department of Defense has created a climate which is conducive to most effective communication at management levels between the contract audit function and contractors, individually or collectively, on matters of contract audit significance. In a spirit of mutual understanding and re-

spect for each other's responsibilities and objectives, the atmosphere can be exploited to the benefit of both Government and the contractor. Routine matters, as well as most other audit matters of concern to the contractors, can and will be resolved at the field auditor level. However, contractors are assured that audit management at every level in DCAA is available for discussion and resolution of problems and for consideration of suggestions for improving DCAA/contractors relations.

Cooperation with Contractors. DCAA is keenly aware that industry is a major partner in the country's continuing effort to obtain the high quality military hardware and the research and development necessary to advance our defense posture. The Secretary of Defense has called for increased cooperation between the Government and its contractors to achieve this goal. Through training and experience, DCAA auditors have learned to recognize that the legitimate motivation of contractors to maximize their profits on defense contracts is not in conflict with audit's responsibility to review contract cost representations and make appropriate recommendations and suggestions to contracting officers. DCAA's organizational alignment within the Department of Defense fosters the professionally independent status of the auditors in the performance of their examinations and the formulation of their conclusions. DCAA management will continue to remind its auditors that the exercise of this independence imposes a responsibility on each of them for self-appraisal to assure that their position is at all times objective and sound. Major emphasis will also continue to be placed on professional competence, high integrity and fairmindedness as basic requisites in the reviews and evaluation of contractors' cost representations.

The advantages from the Government's side include reduced cost of audit through more efficient staff utilization, elimination of duplication in regional office administration, ability to provide better training in audit techniques and audit management, greater uniformity in cost interpretations and strengthening of the procurement liaison program.

While day to day operations are under the control of the director of the agency, a Defense Contract Audit Advisory Council has been established to monitor its performance. The council members consist of: the Deputy Secretary of Defense, Chairman; the Assistant Secretary of Defense (Comptroller), Alternate Chairman; the Assistant Secretary of Defense (Installations and Logistics); the Assistant Secretaries of the Military Department-
(Continued on page 24)



Mr. William B. Petty, Director, Defense Contract Audit Agency (DCAA). Prior to his appointment to DCAA in January 1965, Mr. Petty was Deputy Comptroller of the Air Force. He also held several other positions in the Air Force in the contract auditing field. Mr. Petty holds an AB degree from the University of Illinois and is a Certified Public Accountant.

Reliability Keystone Of The Space Age

by

Maj. Gen. G. F. Keeling, USAF

**Dep. Chief of Staff, Procurement & Production
Headquarters, Air Force System Command**



Maj. Gen. G. F. Keeling, USAF

Reliability is the keystone of the space age. To meet the challenge of space, we must direct a concerted effort to the design of vehicles that enjoy reliability far beyond that required in an earthbound environment.

During the development of the Minuteman ballistic missile, the Ballistic Systems Division of the Air Force Systems Command, in conjunction with North American Aviation, Inc., established a series of specifications designed to guarantee the highest attainable degree of reliability in electronic parts being programmed into the Minuteman weapon system.

These specifications (MIL-38100 Series) defined in detail the quantitative reliability requirements of specific parts and established the test and demonstration procedures to verify that the spec reliability had actually been achieved.

To ensure the continued production of parts of established reliability, the Air Force has issued MIL-STD-839, which directs the use of parts of established reliability of future Air Force programs. The qualified parts list of this MIL-STD will be expanded as rapidly as new qualifiers are verified.

The Space Parts Working Group, composed of representatives from industry, the Military Services and NASA, studied in depth the requirements for units to be utilized in space. They found that the most reliable parts developed under the Minuteman program were only marginal for space probes as well as for manned and unmanned orbital vehicles.

Using the base lines developed for the Minuteman specifications as a departure point, the Working Group expanded these parts specifications to satisfy the most urgent current space reliability requirements.

Quantitative reliability requirements are now mandatory in all new Air Force contracts, and we will continue to use these quantitative requirements to an even greater extent. Applying quantitative requirements for reliability to our contracts has given us problems which must be solved.

One of these is the frequent difficulty of measuring the quantitative characteristics in systems, subsystems and components. This problem has opened wide the field of reliability demonstration. Specialists are required in statistics of reliability and in engineering analysis. Techniques of testing will have to be devised. New environmental chambers and controls will have to be constructed to simulate either expected real-life environments or more severe environments for accelerated testing. Research must be performed to successfully exploit the time and money-saving techniques of accelerated testing, as well as the physics of aging and failure.

A second problem pertaining to quantitative reliability requirements is the definition of failure itself. This is necessary to determine compliance with contractually stated quantitative reliability requirements. Today there are still gray areas which have to be made either black or white. In a recent reliability demonstration program, the test equipment was very complex—more complex than the system under test itself. When the test got under way, we started getting failures; some were valid failures of the system, but most were test equipment failures. As a result, the isolation of true failures became our most important problem.

Third, we must consider the analysis of where and when to apply high reliability effort. High reliability carries a price tag—if not in dollars, then in time, in weight or in space. The high cost of reliability forces us to be selective. We cannot afford to spread the sweet icing of reliability over the entire cake. Since we must reserve it for the most critical components and systems, there is an increasing need for analysis of the trade-offs of reliability, dollar cost, time, weight and space.

Fourth, we must improve communication between the many Government agencies and the industry design groups, since basic design almost always predetermines reliability. We must devise a more uniformly acceptable symbology, and we need a system that will provide rapid knowledge of the classification, availability and design criteria for old items available on the market as well as the newer technologies such as integrated circuits.

This brief review of the problem areas should not obscure the progress that has been made in achieving quantitative reliability in many Air Force programs. Now Air Force and industry must renew their efforts to solve jointly the problems that remain. The challenge is here; the initiative is up to us.

Design Study Contractors Named for V/STOL Fighter

The U.S. Air Force has named four contractors to take part in a design study effort on an advanced vertical short take-off and landing (V/STOL) tactical fighter program.

The contracts, which will be funded at approximately \$1 million each, were awarded to Lockheed Aircraft Corp., Burbank, Calif.; McDonnell Aircraft Corp., St. Louis, Mo.; Republic Aviation Corp., Farmingdale, N. Y.; and The Boeing Co., Seattle, Wash.

Purpose of the six-month studies is to obtain information on various V/STOL fighter designs. The studies will cover various aircraft configurations for tactical missions, including close support of ground troops.

The Federal Republic of Germany is funding parallel studies with two German firms.

These design studies will permit the evaluation of various industry concepts for a V/STOL tactical fighter.

Civil Defense Course Sponsored by OCD

The Office of Civil Defense (OCD), Department of Defense, is sponsoring three courses in nuclear defense planning to be held at colleges and universities throughout the nation during the 1965-66 academic year.

Professional architects and engineers interested in civil defense are invited to enroll in the courses free of charge. The study programs, taught by college professors under contract by OCD, are titled Fallout Shelter Analysis, Protective Construction and Environmental Engineering.

Specific information on locations, course content and enrollment procedures can be obtained by contacting the nearest state or local civil defense office or regional office of OCD. Regional offices are located at Harvard, Mass.; Olney, Md.; Thomasville, Ga.; Denton, Tex.; Battle Creek, Mich.; Denver, Colo.; Santa Rosa, Calif. and Everett, Wash.

DEPARTMENT OF DEFENSE

Dr. Timothy W. Stanley, formerly on the Policy Planning Staff, Office of the Asst. Secretary of Defense (International Security Affairs), has been appointed Assistant to the Secretary of Defense for NATO Force Planning, a newly created position.

Maj. Gen. Charles J. Timmes, USA, is the new Dir., Remote Area Conflict (Project AGILE), Advanced Research Projects Agency. He replaced Maj. Gen. R. H. Wienecke, USA (Ret.).

Maj. Gen. Ray J. Laux, USA, former Commander, Defense Subsistence Supply Center, has become Commander, Defense General Supply Center, Richmond, Va. He succeeds RAdm. James S. Dietz, USN, who has assumed command of the Navy Supply Center, Norfolk, Va.

Maj. Gen. James C. Sherrill, USAF, has been designated Dep. Dir. for Transportation, J-4, The Joint Staff, Office of the Joint Chiefs of Staff.

Brig. Gen. David I. Liebman, USAF, has been assigned as Military Assistant to the Asst. Secretary of Defense (Public Affairs). He replaces Capt. Hugh Robinson, USN, who has been reassigned to the Office of Chief of Naval Operations. Capt. Lloyd V. Young, USN, has been assigned as Special Assistant to the Dep. Asst. Secretary of Defense (Public Affairs).

Lt. Col. Hugh B. Mitchell, USAF, MC, has been appointed Dep. Dir., Armed Forces Radiobiology Research Institute, replacing Col. Carl L. Hansen, Jr., who has retired.

Maj. Gilbert M. Billings, USAF, has been assigned to the Business & Labor Div., Office of Asst. Secretary of Defense (Public Affairs).

ARMY

Brig. Gen. M. J. Reichel has been designated Director of Transportation.

Brig. Gen. Roger M. Lilly is the Commanding General of the Automatic Data Field Systems Command, Fort Belvoir, Va., a new organization.

Brig. Gen. Howard P. Persons, former Dep. Commanding General for Air Defense Systems, U. S. Army Missile Command, has been reassigned as Asst. Chief of Staff for Operations, Training, Plans & Combat Development, U. S. Army Air Defense Command, Ent. AFB, Colo. Col. C. C. Harvey, Jr., has been nominated for promotion to brigadier general and has succeeded Gen. Persons as Dep. Commanding General for Air Defense Systems, U. S. Army Missile Command.

Dr. Lawrence E. Kellion, Scientific Advisor of the Test Directorate, U. S. Army Electronic Proving Ground, Fort Huachuca, Ariz., has been detailed as Chief Scientist of that installation.

Col. James A. Thetford has assumed duties as Chief, Technical Liaison Office, Office of the Chief of Engineers.



ABOUT PEOPLE

Lt. Col. Bernard G. Elfert is now the Commanding Officer of the U. S. Army Chemical Research & Development Laboratories, Edgewood Arsenal, Md.

NAVY

RAdm. Alexander C. Husband has been appointed Chief, Bureau of Yards and Docks replacing RAdm. P. Corradi.

RAdm. B. W. Sarver has become Project Manager of PM-3 Surface Missile Systems. He replaces RAdm. E. T. Reich.

Maj. Gen. William R. Collins, USMC, has been assigned as Asst. Chief of Staff, G-3, Hq., U. S. Marine Corps.

Brig. Gen. Edward H. Hurst, USMC is the new Dir., Marine Corps Landing Force Development Center, Marine Corps Schools, Quantico, Va.

Col. Frank E. Garretson, USMC, selected for promotion to brigadier general, has become Marine Corps Liaison Office to the Chief of Naval Operations.

Capt. William O. Powell, Jr., is the new Commanding Officer of the U. S. Naval Avionics Facility, Indianapolis, Ind.

Col. Robert E. Baldwin, USMC, has replaced Col. Walter J. Ridlon, USMC, as Supply Officer, Marine Corps Schools, Quantico, Va.

AIR FORCE

Brig. Gen. Douglas E. Williams is the new Vice Commander of the Air Force Communications Service.

Recent assignments in the Air Force Systems Command (AFSC): Brig. Gen. Robert C. Richardson, III, as Dep. Chief of Staff, Research & Technology, Hq., AFSC; Col. Elwood M. Douthett, Dir., Rocket Propulsion Laboratory, Edwards AFB, Calif.; Col. Roy C. Hefebower, Jr., Chief, Concepts Planning Div., Directorate of Policy & Concepts Planning, Hq., AFSC; Col. Walter C. Vitunac, Dir., Foreign Technical Data Management, Hq., AFSC; and Col. Walter B. Milburn, Jr., Chief, Management Contract Office, Electronic Systems Div., L. G. Hanscom Field, Mass.

Col. Seymour Stearns has been assigned as Dir. of Requirements, DCS/Plans & Programs, Hq., Air Force Communications Service.

The following are nominations for general officer promotions announced by the Air Force.

To be major general: Brig. Gen. W. E. Creer, Commander, 823rd Air Div., SAC; Brig. Gen. Loren G. McCollom, Dep. Commander, 17th Air Force; Brig. Gen. Thomas B. Whitehouse, Chief of Staff, USMACTHAILAND; Brig. Gen. Joseph L. Dickman, Dir. of Operations, J-3, NORAD and CONAD; Brig. Gen. Thomas R. Ford, Dep. Chief of Staff, Materiel, Air Defense Command; Brig. Gen. W. W. Wisman, Dep. Dir. for Operations, J-3, JCS; Brig. Gen. Joseph J. Cody, Jr., DCS/Systems, AFSC; Brig. Gen. Richard S. Abbey, Dep. Chief of Staff, USMACV; Brig. Gen. W. D. Greenfield, DCS/Operations, Air Defense Command; Brig. Gen. Howard A. Davis, Dir. of Studies & Analysis, Hq., USAF; Brig. Gen. T. F. O'Keefe, Asst. for Logistics Plans, Hq., USAF; Brig. Gen. L. S. Lightner, Dep. Dir., Legislative Liaison, Hq., USAF; and Brig. Gen. Richard H. Ellis, Dep. Dir., Plans & Policy, J-5, JCS.

To be brigadier general: Col. Roger E. Phelan, Dep. Dir. of Plans for Policy, Hq., USAF; Col. D. E. Riley, Dep. for Systems Management, Electronic Systems Div., AFSC; Col. John E. Frizen, DCS/Operations, Air Force Communications Service; Col. Leo A. Kiley, Commander, AF Cambridge Research Laboratories; Col. C. H. Bolender, Dir., Apollo Mission, NASA; Col. Leo P. Geary, Program Dir., SR-71/YF-12A, Hq., USAF; Col. H. B. Kucheman, Jr., Dep. for Unmanned Systems, Space Systems Div., AFSC; Col. James F. Kirkendall, Executive to Chief of Staff, Hq., USAF; Col. Frederick E. Morris, Jr., Comptroller, Hq., AFLC; Col. W. V. McBride, Military Asst., Office of Secretary of the Air Force; Col. J. S. Chandler, Jr., Asst. Dep. Commander for Space (MOL), AFSC.

DDC Documents Now Available in Microfiche

Scientific and technical documents in a new miniature form are available for all current accessions of the Defense Documentation Center (DDC), at Cameron Station, Alexandria, Va. Documents are now processed on the 4x6-inch sheet film, known as microfiche, and are available to all DOD components, their contractors and grantees who are authorized DDC services.

Microfiche can be stored and retrieved with all the convenience of file cards and mailed in ordinary envelopes. They will average two microfiche to a document.

DDC users can read or reproduce full-sized copies of reports from microfiche using equipment now on the market.

The "SAWS" Corporation Ideas-Plans-Programs

Located on a military reservation not too many miles from Augusta, Ga., is a unique "industrial corporation"—called the "SAWS"¹ Corporation—that is rapidly becoming famous. This facility is known not for the merchandise or services it manufactures, but for the production of some of the most vital commodities used in the industrial defense and disaster planning programs of certain selected industrial facilities: IDEAS—PLANS—PROGRAMS.

The Saws Corporation in its hypothetical role produces electron tubes and, as such, is included on the Department of Defense Key Facilities List. For training purposes it comes under the purview of the Department of Defense Industrial Defense Program.

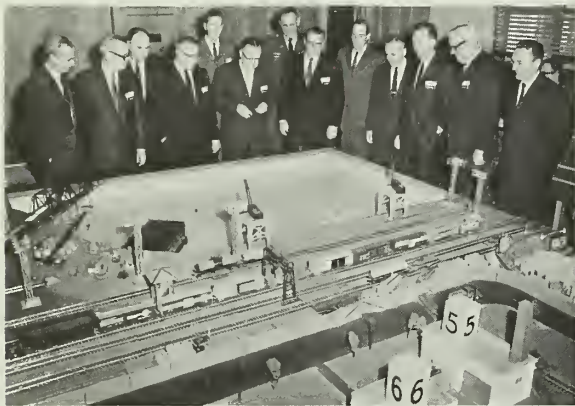
Early in World War II, manpower used to protect industrial plants engaged in war production ran into hundreds of thousands. Realizing that we could not afford the luxury of such manpower utilization in the future, need was recognized for more selectivity in designating facilities as vital to the defense of our country. The Key Facilities List was originated to meet this requirement and in 1952 the corresponding Department of Defense Industrial Defense Program was established. This program is designed to assure the uninterrupted production capability of these vital facilities through the use of non-military measures.

The Saws Corporation, a miniature model of an imaginary industrial facility, is the focal point for the development of many emergency planning principles taught in the Industrial Defense and Disaster Planning for Privately-Owned and Privately-Operated Facilities Course (POPO) at the U.S. Army Military Police School, Fort Gordon, Ga.

Although "located" on a military installation, the Saws Corporation is concerned with non-military or passive defense measures. Industry is not expected to defend itself against an armed enemy; this is a military operation. Management, however, is expected to take measures calculated to prevent sabotage and espionage, to minimize the damage resulting from an enemy attack or a natural disaster and to provide for rapid restoration of production if attack or disaster occurs.

Three or four times each year, key executives from private industry and Governmental agencies seize the management reins of the Saws Corporation. Brought together in a working situation, this select group develops additional insight into the Department of Defense In-

¹ The mythical corporation is named for the four officers who developed the concept—Major Hugo Sanford, Lieutenant Colonel Chester Allen, Major Leonard Walker and Lieutenant Colonel Harold Schwiebert.



Personnel attending Privately-Owned and Privately-Operated Facilities Course (POPO) class gather around the "SAWS Corporation" with Colonel Karl W. Gustafson, Commandant of the U.S. Army Military Police School, center.

dustrial Defense Program and the application of those non-military measures which will assist in providing for the protection of the productive capability of their facilities.

Having recognized the requirement for plant disposal, protection of personnel, continuity of management, records protection, mutual aid programs and other emergency plans, the new management staff goes to work. Raw concepts, basic principles and individual ideas (perhaps the most important ingredient) are presented for Saws Corporation staff consideration. The finished product evolves as a defense and disaster plan which can be adopted, to at least some extent, into the plans of almost every individual facility or installation.

While management of the Saws Corporation changes with each class, the labor force remains relatively constant. The labor force of this plant is the teaching staff of the Industrial Defense and Disaster Planning Committee of the U.S. Army Military Police School. These highly competent faculty members are frequently augmented by guest speakers and instructors who are leaders in their particular field of industry. Graduates of the POPO course could be listed in a Who's Who or Blue Book of industry. Often one of them returns and, in his executive role, makes a presentation to the class in current session.

The five-day POPO course, tuition-free, has been offered to selected management representatives each year since 1958. It is open to executives of privately-owned and privately-operated facilities and of Governmental agencies whose duties include national emergency, mobilization or disaster planning. Priority is given to representatives of facilities appearing on the Department of Defense Key Facilities List. No security clearance is required.

The POPO course will be presented three times during Fiscal Year 1966:

Class #1—November 14-19, 1965

Class #2—February 6-11, 1966

Class #3—April 17-22, 1966

Representatives of facilities included in the Industrial Defense Program who desire to attend should request quotas from industrial defense representatives at the military headquarters that conducts surveys of their facilities. Applicants not associated with the Industrial Defense Program should apply directly to the Office of The Provost Marshal General, Department of the Army, Washington, D. C. 20315.

CORRECTION

Several of our readers have brought to our attention an error in the article, "Approved Map and Plan Security Cabinets Available to Contractors," which appeared on page 21 of the July issue of the Defense Industry Bulletin. The description of the security cabinets was incorrectly listed. The entire article is therefore reprinted below containing the necessary corrections.

Approved map and plan security cabinets are now on the Federal Supply Schedule and available to all authorized contractors who have requirements to store classified Defense information.

There are two types of cabinets available. The first is identified as a Class Five cabinet and affords protection for:

- 30 man-minutes against surreptitious entry.
- 20 man-hours against manipulation of the lock.
- 20 man-hours against radiological attack.
- 10 man-minutes against forced entry.

The other is identified as a Class Six cabinet and affords protection for:

- 30 man-minutes against surreptitious entry.
- 20 man-hours against manipulation of the lock.
- 20 man-hours against radiological attack.

There is no forced entry requirement.

Both of these cabinets have been tested and approved under tests defined in Interim Federal Specifications AA F-00363 (GSA-FSS) and represent an important advance in security protection for classified plans and bulk material.

Navy Long Range Planning Information Available to Scientific & Technical Groups

The Bureau of Naval Weapons (BUWEPS) has a program designed to provide the scientific and technical community with information on the Navy's requirements and objectives in the research and development of future weapons systems.

Called the Long Range Scientific and Technical Planning program, the system provides scientific groups with information about mission concepts, operational requirements and weapon system trends to enable these groups to better direct their effort in the development of Navy weapons systems.

Objectives of the program are:

- To keep scientific and technical groups well informed of the operational and technical problems confronting BUWEPS in planning and developing future weapons systems.

- To encourage industrial groups to provide cooperative assistance to BUWEPS in order that more effective long range research and development plans may be prepared.

- To promote the solution of specific technical problems of interest to BUWEPS.

To cover the broad scientific and technical aspects of this program, three types of projects are handled: Unfunded Study Projects, Plans Analysis Projects and Research and Engineering Problems.

- **Unfunded Study Projects** are established primarily to develop new concepts. These projects support future systems planning at all levels in the BUWEPS Research, Development, Test and Evaluation (RDT&E) Group. They involve extensive original work which may include research, design or development studies. Specific requirements for a study project are developed as required in cooperation with qualified engineers from the cognizant technical office in the RDT&E Group. Qualified scientific groups interested in starting a study project should contact the cognizant office to establish their capability and areas of interest.

- **Under Plans Analysis Projects**, qualified scientific groups review and evaluate selected parts of the Navy's long range research and development plans covering development of systems and components and supporting research. In return for access to BUWEPS planning documents, these groups may be required to provide the Navy with appropriate and analytical comments covering the adequacy and feasibility of the planning information furnished, proposed alternative approaches which may lead to improved performance or lower costs, or other relevant suggestions.

Plans analysis projects are divided into two areas: weapon system plans and technical area plans. Weapon system planning data supporting naval mission areas and operational requirements are released to qualified scientific and technical groups for review, evaluation and comment. A series of technical area planning documents (TAP's) that delineate the RDT&E Group's technical requirements and objectives for supporting research and component development are also released for review and evaluation. Comments on selected planning documents are invited.

- The Bureau periodically defines problems for which it is seeking solutions and consolidates them into classified and unclassified **Research and Engineering Problems** documents. These documents are released to scientific groups that may be able to provide solutions to any of the problems. Proposals for research and development contracts to study or develop solutions to the problems presented are not actively sought and should first be discussed with cognizant technical personnel. Proposed approaches to solutions supported by test data should be submitted in writing to BUWEPS for evaluation and possible contract or additional study effort.

Scientific groups wishing to participate in the Long Range Scientific and Technical Planning Program must meet the following requirements:

- Have the necessary technical competence to engage in research and development work and a reasonable potential to execute a contract.

- Possess a current Department of Defense Industrial Facility Security Clearance equal to the level of classified material involved.

- Have executed the Department of the Navy Policy Agreement.

- Have established with the cognizant engineering office in the Bureau an approved study or plans analysis project, or requested copies of the research problems documents.

The RDT&E Plans Officer will invite scientific groups to participate in the BUWEPS program on the basis of recommendations from sub-group officers. Invitations will include a listing of the procedures to be followed in initiating projects. Policy Agreement Forms, Project Forms and instructions for their completion are forwarded with invitations to participate. These must be returned to the BUWEPS, fully executed, before a project can be established.

Organizations interested in participating in the Long Range Scientific and Technical Planning Program should write to Chief, Bureau of Naval Weapons, Attn: Code R-2, Washington, D.C. 20360. The requesting organization should outline its research capabilities, the specific technical areas in which participation is desired and provide information concerning present security status. Organizations that have signed a Policy Agreement and desire to establish a Plans Analysis Projects should contact the Plans Office by a personal visit or by letter.

Technical Area Plans of 83 projects currently of interest to the Navy are briefly described in a BUWEPS publication titled, "Synopsis of Technical Area Plans." The booklet may be obtained by writing to the Bureau of Naval Weapons, Code R-27, Washington, D.C. 20360.

Following are two examples of how the projects are described in the pamphlet and a complete listing of the projects appearing in the Synopsis:

AERIAL PHOTOGRAPHIC RECONNAISSANCE—Describes briefly five basic missions required of aerial reconnaissance: general reconnaissance, mapping, amphibious reconnaissance, night reconnaissance; and ASW reconnaissance. Current capabilities and limitation of existing equipments are discussed in detail, along with development projects now in existence. Future long range possibilities and requirements are also discussed.

TAP No. FF-1. (CONFIDENTIAL)

TRAINING DEVICES—Describes current problems, capabilities and limitations associated with synthetic operational training. The present programmed effort which requires significant state of the art advancements in simulation, is pointed out and future trends are reviewed. TAP No. FW-1. (CONFIDENTIAL)

Projects described in BUWEPS R&D Long Range Plan Synopsis of Technical Area Plans are listed below:

Meteorological Management Division

FA-1 Atmospheric Physics
FA-2 Meteorological Measuring Systems
FA-3 Meteorological Prediction
FA-4 Weather Modification and Control

Photographic Management Division

FF-1 Aerial Photographic Reconnaissance (CONFIDENTIAL)
FF-2 High Altitude Photography (CONFIDENTIAL)
FF-3 Ground Processing and Printing Equipment (CONFIDENTIAL)
FF-4 Photographic Data Processing (CONFIDENTIAL)
FF-5 Underwater and Submarine Periscope Photography (CONFIDENTIAL)
FF-6 Photographic Interpretation and Intelligence Data Handling (CONFIDENTIAL)

Maintenance Engineering Division

FW-1 Training Devices (CONFIDENTIAL)

Aircraft Development Office

RA-1 Aerodynamics and Hydrodynamics
RA-2 Aircraft Structures
RA-3 Personnel Protective Equipment (CONFIDENTIAL)
RA-4 Aircraft Escape Systems (CONFIDENTIAL)
RA-5 Aircraft Mechanical Equipment (CONFIDENTIAL)
RA-6 Aircraft Electric Power Systems Design
RA-7 Aircraft Electric Distribution Systems and Components
RA-8 Aircraft Lighting
RA-9 Aircraft Reconnaissance Sensors (SECRET)
RA-10 Airborne AEW Surveillance and Control (CONFIDENTIAL)
RA-11 Airborne Weapons Equipment (CONFIDENTIAL)
RA-12 Airborne Communications and IFF (CONFIDENTIAL)

(Continued on page 24)

INDUSTRY BRIEFS

Columbus Division of North American Aviation, Inc., is now awarding gold PRIDE emblems to employees who consistently demonstrate high levels of performance or make a major contribution to the cost reduction, safety and other major programs . . . McDonnell Aircraft Corporation marked the delivery of the 1000th F-4 Phantom aircraft with ceremonies witnessed by DOD officials and over 5,000 plant personnel.

A Sikorsky Aircraft RH-3A helicopter built for the Navy tested its strength recently against a 1,600-ton destroyer escort. The helicopter pulled the vessel, started from a dead stop, at speeds up to 5.3 knots . . . Canada is the third country to acquire Northrop Corporation's F-5 aircraft by direct purchase for its defense inventory. Other two countries are Norway and Spain.

Aerojet General Corporation recently reported that its purchasing and subcontracting awards to small business throughout the United States in FY 1964 totalled \$128,700,000, or 78% of all purchases made during the year . . . The "Think" campaign of Goodyear Aerospace Corporation is paying off. Employees in 1964 submitted a total of 1,255 suggestions as against 579 in 1963. There was a sizable increase in the number of ideas adopted in the cost reduction area . . . Lockheed Aircraft Corporation reports \$50 million in subcontracts went to 6,390 small businesses.

The Cleveland Equipment Group of Thompson Ramo Wooldridge, Inc., received a Certificate from the Industrial College of the Armed Forces for its "significant contributions" to the College's education program . . . The Hughes Aircraft Company's trophy for the top Army ROTC graduate went to a University of Georgia graduate, Second Lieutenant Alexander W. Patterson . . . A booklet issued by the U.S. Industrial Payroll Savings Committee of the Treasury Department lists the 72 major companies with high participation by employees. At the top is Ling-Temco-Vought, Inc., with 92% participation.

The President's Committee on Employment of the Handicapped singled out Raytheon Company for having the most effective program in the nation in this area. It's "Employee of the Year" award was presented to Charles F. Adams, Raytheon Board Chairman, by Senator Edward M. Kennedy of Massachusetts . . . Citizens of Western New York were reminded of the contribution their National Guard Nike missilemen made to national defense by Cornell Aeronautical Laboratory, which featured these "full-time citizens and full-time soldiers" in the firm's magazine, "Perspective."

Sperry Rand Corporation believes in keeping its employees informed of the needs and activities of the military "users" of its equipment. A recent issue of "Sperry-scope" featured by-line pieces by military officials of the Army, Navy and Marine Corps . . . The Air Force commended the Radio Engineering Laboratories' Engineering Department for its contribution to a technical report on communications published by that Service.

Gen. Schriever Heads

Manned Orbiting Laboratory Program

The Secretary of the Air Force has designated General Bernard A. Schriever as Director of the Manned Orbiting Laboratory Program. This assignment is in addition to his duties as Commander, Air Force Systems Command.

As Director for MOL, General Schriever will report directly to the Secretary of the Air Force and will manage the program through a MOL Program Office in the Pentagon.

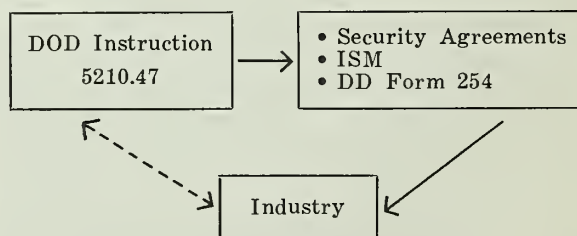
Brigadier General Harry L. Evans will be the Vice Director of the MOL Program. He has been serving as Special Assistant to the Secretary of the Air Force for MOL.

Brigadier General Russell A. Berg will be the Deputy Director of the MOL Program in charge of the MOL System Office located at the Space Systems Division headquarters in Los Angeles, Calif. He will have the additional duty of Deputy Commander of Space Systems Division for MOL.

DOD Security Instruction 5210.47 Clarified

In response to queries from defense industry, an explanation of that part of DOD Instruction 5210.47, "Security Classification of Official Information," which states that DOD components "shall accomplish its application to contractors" has been provided by the Office of the Assistant Secretary of Defense (Manpower).

DOD Instruction 5210.47 is the primary directive used in determining policy and guidelines on the security classification of official information insofar as the DOD and its contractors are concerned. Its linkage to defense industry is the Industrial Security Manual (ISM) for Safeguarding Classified Information (currently being revised to reflect the requirements of the Instruction), security agreements (DD Form 441 and security requirement clauses in procurement contracts), and the Security Requirements Check List, DD Form 254. The following diagram will illustrate the relationship:



DOD Instructions normally are distributed only within the department. However, 5210.47 may be read and/or duplicated by anyone.

A familiarity with the provisions of DOD Instruction 5210.47 should be helpful because its application will be designed to bring about, both within the DOD and the defense industry, a consistent and uniform approach to problems of security classification and management of classified information.

S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S
5	6	7	1	2	3	4	3	4	5	6	7	1	2	7	1	2	3	4	5	6
12	13	14	15	16	17	18	10	11	12	13	14	15	16	14	15	16	17	18	19	20
19	20	21	22	23	24	25	17	18	19	20	21	22	23	21	22	23	24	25	26	27
26	27	28	29	30			24	25	26	27	28	29	30	28	29	30				
							31													
SEPTEMBER 1965							OCTOBER 1965							NOVEMBER 1965						

SEPTEMBER 1965

OCTOBER 1965

NOVEMBER 1965

SPEAKERS CALENDAR

OFFICE OF THE SECRETARY OF DEFENSE

Hon. Harold Brown, Dir., Defense Research & Engineering, at dedication of Massachusetts Institute of Technology's Center for Material Science Engineering, Cambridge, Mass., Sept. 30.

VAdm. J. M. Lyle USN, Dir., Defense Supply Agency, at National Security Industrial Assn. Annual Dinner, Washington, D. C., Oct. 7. (Appearance only.)

Mr. Daniel J. Fink, Dep. Dir. of Defense Research & Engineering for Strategic & Defensive Systems, at 7th Annual North American Defense Command Electronic Warfare Conference, Ent AFB, Colo., Oct. 12.

Maj. Gen. W. S. Steele, USAF, Dep. Commandant, Industrial College of the Armed Forces (ICAF), Dr. J. Poppe, Professor of Economics, ICAF, and Col. C. F. Austin, USA, Plans, Policy & Curriculum Officer, ICAF, at West Coast Federal Personnel Management Conference, San Francisco, Calif., Oct. 28.

ARMY

Gen. Harold K. Johnson, Chief of Staff, at 11th Army Human Factor Research & Development Conference, Fort Bragg, N. C., Oct. 5; at National Security Industrial Assn. Luncheon, Washington, D. C., Oct. 7; at Assn. of the U. S. Army Convention Luncheon, Oct. 26.

Maj. Gen. A. W. Betts, Dep. Chief of Research & Development, at National Security Industrial Assn. Dinner, Oct. 7, (Appearance only.)

Lt. Gen. William F. Cassidy, Chief of Engineers, at Propeller Club of the U. S. Convention, Galveston, Tex., Oct. 13.

Lt. Gen. William W. Dick, Jr., Chief of Research & Development, at Fall Meeting of Army Scientific Advisory Panel, Detroit, Mich., Oct. 21-22.

Hon. Stanley R. Resor, Secretary of the Army, at Assn. of U. S. Army Annual Meeting, Washington, D. C., Oct. 25; at Army Aviation Assn. Annual Honors Luncheon, Washington, D. C., Oct. 29.

NAVY

Hon. Paul H. Nitze, Secretary of the Navy, at 75th Anniversary of Naval Propellant Plant, Indian Head, Md., Sept. 25; at National Security Industrial Assn. Dinner, Oct. 7. (Appearance only.)

Mr. W. A. Doyle, Dir. of Management Div., Office of Naval Material, at 4th Bureau of Weapons Industrial Relations Officers Meeting, Chicago, Ill., Sept. 27.

RAdm. P. Corradi, Chief of Bureau of Yards & Docks, at American Society of Civil Engineers, Kansas City, Mo., Oct. 18.

Adm. David L. McDonald, Chief of Naval Operations, at Navy League Dinner, Richmond, Va., Oct. 19.

VAdm. I. J. Galantin, Chief of Naval Material, at Defense Weapons Systems Management Center, Wright-Patterson AFB, Ohio, Oct. 1; at Systems Effectiveness Conference, Sheraton-Park Hotel, Washington, D. C., Oct. 19.

AIR FORCE

Gen. H. M. Estes, Jr., Commander, Military Air Transport Service, at

Allison Div., General Motors Corp., Indianapolis, Ind. Oct. 6.

Hon. Norman S. Paul, Under Secretary of the Air Force, at National Security Industry Assn. Dinner, Oct. 7. (Appearance only.)

Lt. Gen. W. A. Davis, Vice Commander, Air Force Systems Command, at Systems Effectiveness Conference, Sheraton-Park Hotel, Washington, D. C., Oct. 19.

Lt. Gen. T. P. Gerrity, Dep. Chief of Staff, Systems & Logistics, at Defense Supply Assn. Convention, Oct. 20. (Appearance only.)

Gen. B. A. Schriever, Commander, Air Force Systems Command, at Space Electronics Symposium, Miami, Fla., Nov. 3; at Heron Award Ceremony, Wright-Patterson AFB, Ohio, Nov. 17.

Gen. J. P. McConnell, Chief of Staff, at Calvin Bullock Forum, New York, N. Y., Nov. 16.

Navigation Roller Map Display System New Navy Concept

The U.S. Navy is developing a new concept in air navigation which provides pilots with a continuous presentation of their geographical position on an unperforated strip of standard aeronautical chart.

The Navigation Roller Map Display System, which is the first of its kind, will be installed in the Navy's A-7A light attack aircraft.

Operational use of the system furnishes continuous and automatic geographic information during the total mission profile. The map strip, loaded into compact cartridges, provides a moving map display that accommodates annotation on the chart prior to or during flight in permanent written form for in flight reference or post flight debriefing.

The roller map system, under contract to Applied Science Industries, Inc., of Falls Church, Va., has undergone extensive engineering redesign in an attempt to reduce complexity and cost with increased reliability, maintainability and accuracy.

Of seven firms competing to supply the system, Applied Science Industries was the only small business concern indicating an interest and capability in this specialized field.

Small Company Wins Big Contract With Good Product

Managers of small businesses who fear competing against the sometimes extensive technical and engineering services of large companies should be encouraged by the experience of Crate-Rite, Inc., of Oakland, Calif. Crate-Rite, with a total of 25 employees, manufactures shipping containers and carrying cases from such materials as wood, metal and fiberglass.

The company was recently successful in developing, testing and supplying fiberglass transit cases for a Navy contractor who had received a large order for electronic counters which had to be packaged to meet rigid specifications. Until then the counters had been supplied to the Government in aluminum-laminated - to - plywood transit cases. These, in turn, were overpacked in large cushion "floaters" and three corrugated containers.

Since a better, less expensive packaging system was needed, several companies were invited to bid. Crate-Rite, the smallest contestant, won the subcontract with a fiberglass case which met or exceeded the military specifications and saved over 22,000 pounds in freight weight for the order and approximately \$10,000 in packaging costs.

NOTES FOR EDITORS

Briefed below are some events and projects within the Department of Defense which may be of interest to writers and editors. If further information on any of these topics is desired, please write to Chief, Magazine and Book Branch, Office of Assistant Secretary of Defense, Public Affairs, Washington, D. C. 20301

ARMY STRIVES FOR COMFORT AND SAFETY IN FLIGHT GEAR

The U.S. Army is conducting a research program at the Natick Laboratories in Massachusetts to develop safer and more comfortable equipment for aircraft pilots and crewmembers.

Included in the program is the perfection of an air conditioned flight helmet, more flexible and comfortable body armor and a cold weather boot that enables pilots to feel the foot controls of their aircraft.

NEW RESEARCH SUBMARINE DIVES 6,000 FEET IN FIRST OPERATION

ALVIN, the Navy's first deep-diving research submarine, successfully completed its initial dive to a depth of 6,000 feet July 20 off Andros Island in the Bahamas, 120 miles southeast of Miami. ALVIN stayed on the bottom for 20 minutes and all systems checked out satisfactorily. Further dives are set for later this year. As the first phase of a long-range deep research vehicle program, ALVIN is a tool which will enable oceanographers to make "on site" observations of deep water conditions.

With much greater range and maneuverability than the bathyscaph TRIESTE, ALVIN will be capable of more extensive research. For example, biologists will be able to observe directly the concentrations and behavior of marine life in deep water in the same manner as scuba divers in shallow water. Geologists will be able to inspect larger areas of the sea floor and obtain better samples of the bottom. Temperature, underwater currents, magnetic field, gravity field and various other properties of the ocean environment can be measured more accurately from a vehicle such as ALVIN.

NEW ULTRASONIC CORROSION DETECTOR EXPECTED TO PRODUCE AIR FORCE SAVINGS

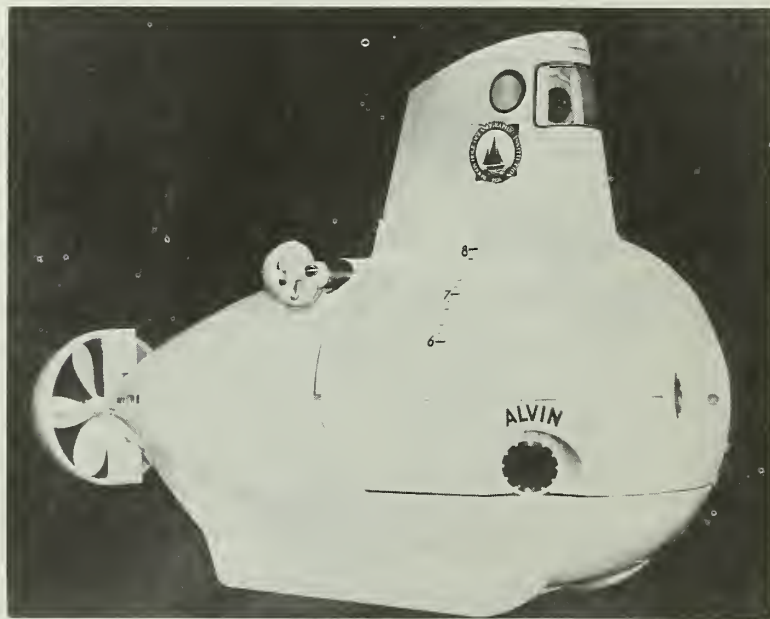
The Air Force has developed an ultrasonic corrosion detector which can inspect aircraft fuel tanks in a fraction of the time it now takes. The new device, mounted on a trailer, is guided under the wing of a parked aircraft and raised until it touches the underside of the metal wing. Ultrasonic sound waves are then bounced against the skin of the aircraft. The detector is reported to be more accurate than the human eye. In tests of C-130 aircraft faying surfaces (when metal joints overlap), only five per cent of the corrosion indicated by the equipment was spotted by visual inspection.

Present inspection methods, which call for draining the fuel, purging and entering the tanks and, in some cases, removing the sealant for visual inspection, are too costly and time-consuming. Scientists at the Air Force Materials Laboratory, Wright-Patterson AFB, Ohio, predict that savings, both in time and money, will be considerable once inspection units are available in greater numbers.

NAVY TO BUILD DEEP SUBMERGENCE COMPLEX AT ANNAPOLIS

Plans for the construction of a multi-million dollar deep submergence research complex have been announced by the U.S. Navy Marine Engineering Laboratory (MEL) of Annapolis, Md.

The pressure tank complex will simulate conditions in the deepest areas of the ocean and will be used to develop and test equipment designed for use at extreme depths. Three tanks in the complex will create ocean pressure conditions ranging from the surface to a depth of more than 56,000 feet, 50 per cent deeper than the deepest recorded depth. They will be built of high strength steel—up to 20 inches thick for the largest tank—and have a combined weight of 1,125 tons. Largest of the chambers will operate at a maximum pressure of 12,000 pounds per square inch, equal to pressure found about five miles down in the ocean. Navy planners, realizing that future submarines will go deeper and stay down longer, expect the MEL complex to help answer many questions concerning the capabilities of men and their equipment to function at extreme depths.



The Navy's new research submarine ALVIN dives to depths of 6,000 feet in tests in the Bahamas. The craft is manned by a two-man crew. It is 22 feet long and weighs 11 tons. ALVIN will be used primarily for oceanographic research. (SEE SECOND ITEM, NOTES TO EDITORS.)

The Air Force R&D Acquisition Process

by

Lt. Colonel N. Warren Graves, USAF
Chief, Research & Development Division
Office of DCS/Procurement & Production
Headquarters, Air Force Systems Command

The Air Force emphasizes the team approach in acquisition of research and development (R&D). The planner, scientist, manager, project engineer and contracting officer are all considered to be in the business of acquiring or, if you prefer, procuring R&D. Therefore, in this discussion the word procurement is used in its broad sense and interchangeably with the word acquiring. No attempt will be made to discuss procurement in the technical sense of purchasing or contracting. It is sufficient to say that technical procurement considerations enter into all steps of the acquisition process except the earliest planning steps.

In discussing how the Air Force acquires R&D, it is important that R&D be defined and responsibilities within the Air Force for its acquisition be specified. The Armed Services Procurement Regulation describes the five categories of R&D that we are concerned with here as:

"(1) **Research**—Includes all effort directed toward increased knowledge of natural phenomena and environment and efforts directed toward the solution of problems in the physical, behavioral and social sciences that have no clear direct military application. It would, thus, by definition, include all basic research and, in addition, that applied research directed toward the expansion of knowledge in various scientific areas. It does not include efforts di-

rected to prove the feasibility of solutions of problems of immediate military importance or time-oriented investigations and developments.

"(2) **Exploratory Development**—Includes all effort directed toward the solution of specific military problems, short of major development projects. This type of effort may vary from fairly fundamental applied research to quite sophisticated bread-board hardware, study, programming and planning efforts. It would thus include studies, investigations and minor development effort. The dominant characteristic of this category of effort is that it be pointed toward specific military problem areas with a view toward developing and evaluating the feasibility and practicability of proposed solutions and determining their parameters.

"(3) **Advanced Development**—Includes all effort directed toward projects which have moved into the development of hardware for experimental or operational test. It is characterized by line item projects and program control is exercised on a project basis. A further descriptive characteristic lies in the design of such items being directed toward hardware for test or experimentation as opposed to items designed and engineered for eventual Service use.

THE R & D CYCLE

	RESEARCH	EXPLORATORY DEVELOPMENT	ADVANCED DEVELOPMENT	ENGINEERING DEVELOPMENT	OPERATIONAL SYSTEMS DEVELOPMENT
	← TECHNOLOGY →			← WEAPONS DEVELOPMENT →	
BASIC ORIENTATION	SCIENTIFIC	SCIENTIFIC	SCIENTIFIC	ENGINEERING (SYSTEMS ENGINEERING)	ENGINEERING (PRODUCTION ENGINEERING)
BASIC PURPOSE	TO EXPLORE THE UNKNOWN	TO ACQUIRE KNOWLEDGE OF SELECTED THEORETICAL APPROACHES VIA LABORATORY TEST	TO ACQUIRE KNOWLEDGE OF NATURAL PROCESSES THROUGH EXPERIMENTAL TEST	TO PERFORM SYSTEMS ENGINEERING PROGRAM DEFINITION PHASE, OPS CONCEPT & COST EFFECTIVENESS	TO PERFORM SYSTEMS ACQUISITION (OPERATIONAL)
END PRODUCT	KNOWLEDGE OF FUNDAMENTAL NATURAL PROCESSES	A REPORT A BENCH MODEL FOR FEASIBILITY OR ON AN EXPERIMENTAL COMPONENT	MAJOR HARDWARE ITEM FOR EXPERIMENTAL TEST	A COMPLETE SYSTEM WHOSE ENGINEERING DESIGN OPS, CONCEPT, AND COST EFFECTIVENESS HAS BEEN CONFIRMED	PRODUCTION ITEM FOR USE BY OPERATIONAL COMMAND
DIRECTION OF EFFORT	NOT DIRECTED TOWARD SOLUTION OF MILITARY PROBLEMS	DIRECTED TOWARD SOLUTION OF MILITARY PROBLEM - SHORT OF DEVELOPMENT OF HARDWARE FOR EXPERIMENTAL TESTING	DIRECTED TOWARD SOLUTION OF MILITARY PROBLEM - TO INCLUDE DEVELOPMENT OF HARDWARE FOR EXPERIMENTAL TEST	DIRECTED TOWARD THE ACQUISITION OF DATA NEEDED TO MAKE A JUDGEMENT CONCERNING WHETHER OR NOT TO "GO OPERATIONAL" (DESIGN/COST/OPS DATA)	DIRECTED TOWARD ACQUISITION OF OPERATIONAL SYSTEM FOR AF INVENTORY
MANAGEMENT GROUPINGS	BY ACADEMIC DISCIPLINES • PHYSICAL SCIENCES • ENVIRONMENTAL SCIENCES • MATHEMATICAL SCIENCES • PSYCHOLOGICAL SCIENCES • BIOMEDICAL SCIENCES	BY SUBJECT TITLES 1. SPACE 2. ELECTROMAGNETIC MATERIALS 3. FLIGHT CONTROL ETC	BY HARDWARE CATEGORIES 1. AERONAUTICS 2. SPACE 3. BALLISTIC MISSILES 4. ELECTRONICS	BY HARDWARE CATEGORIES 1. AERONAUTICS 2. SPACE 3. BALLISTIC MISSILES 4. ELECTRONICS 5. OPS SUPPORT	BY FORCE STRUCTURE 1. STRATEGIC FORCES 2. DEFENSIVE FORCES 3. GENERAL PURPOSE FORCES 4. AIRLIFT FORCES 5. GENERAL SUPPORT FORCES
REQUIREMENT	DO NOT REQUIRE SPECIFIC MILITARY PROBLEM	DO NOT REQUIRE SPECIFIC HARDWARE PAY-OFF	BEGIN TO QUESTION MILITARY UTILITY	SPECIFIC MILITARY MISSION OR USE DEFINED IN DETAIL INTEGRATED WPN SYS, OR MAJOR COMMON OR SUB-SYS	SPECIFIC OPERATIONAL REQUIREMENT INCLUDING NUMBER OF SITES & HARDWARE UNITS
TECHNICAL RISK	HIGH	HIGH	HIGH	MODERATE	LOW
E. G.	PLASMA DYNAMICS CRYSTAL PHYSICS COSMIC RADIATION NETWORK THEORY MAN-MACHINE RELATIONS BIOMATHEMATICS	AUTOMATIC TERRAIN AVOIDANCE ADVANCED ICBM GUIDANCE LAMINAR FLOW CONTROL NEW PROPELLSION CYCLES COMPUTER TECHNOLOGY RECONNAISSANCE TECHNIQUES	AERONAUTICS X-15 - V-STOL & VTOL *FT LAMINAR FLOW AIRCRAFT MACH 9 RAM JET SPACE MOL - ASSET ION ENGINE BALLISTIC MISSILES STELLAR INERTIAL GUIDANCE ADVANCED ICBM TECHNOLOGY HIGH ENERGY SOLID PROPELLANTS ELECTRONICS REMOTE DETECTION COIN RADAR ADVANCED AIRBORNE WARNING	AERONAUTICS XB-70 CX-HLS SPACE TITAN III ATLAS-AGENA SPACE DEFENSE BALLISTIC MISSILES ADVANCED REENTRY ELECTRONICS INTELLIGENCE DATA HANDLING OPS SUPPORT AIRCRAFT FLARE	STRATEGIC FORCES ATLAS-TITAN-MINUTEMAN DEFENSIVE FORCES SPADATS GENERAL PURPOSE FORCES F-111A AIRLIFT FORCES C-141 GENERAL SUPPORT SUPPORT TO ALL WEAPON SYSTEMS
	← NOT APPROVED FOR THE OPERATIONAL INVENTORY →			← APPROVED →	

FIG.1

"(4) **Engineering Development**—Includes all effort directed toward those development programs being engineered for Service use but which have not yet been approved for procurement or operation. This area is characterized by major line item projects and program control will be exercised by review of individual projects.

"(5) **Operational System Development**—Includes all effort directed toward development, engineering and test of systems, support programs, vehicles and weapons that have been approved for production and Service deployment. This area is included for convenience in considering all RDT&E projects. All items in this area are major line item projects which appear as RDT&E Costs of Weapons Systems Elements in other programs. Program control will thus be exercised by review of the individual research and development effort in each Weapon System Element."

Within the Air Force the responsibility for acquiring R&D is assigned to two commands. The Office of Aerospace Research (OAR) is responsible for acquisition of research. The Air Force Systems Command (AFSC) is responsible for acquisition of exploratory development, advanced development, engineering development, and operational systems development. In addition AFSC is responsible for the acquisition of systems with which the Air Force operational force structure is to be equipped. Stated another way, the mission of AFSC is to advance aerospace technology, adapt that technology to aerospace systems and acquire qualitatively superior aerospace systems and material needed to accomplish the Air Force mission.

Figure I is a spread sheet on the R&D cycle showing the interrelationship of the categories, the progression from research through operational systems development and examples of each. In theory, systems progress through this cycle; in practice, a new system may originate at almost any point dependent on earlier research or development, priority, etc.

Now that terms and responsibilities are identified, the remainder of this discussion will be addressed to the development categories or the AFSC responsibilities for acquiring R&D. This is not to slight the importance of basic research, but that part of the R&D spectrum is not directed toward the solution of military problems as such and is, therefore, severable. Also, the development categories relate more directly to each other and constitute the major part of the R&D cycle.

The best vehicle to show the Air Force R&D acquisition process is a planning, progression chart showing the various approval/action levels, the key points in the process and their interrelationship. Such an idealized portrayal is shown in Figure II.

It should be kept in mind that each step is subject to deferral or acceleration as well as systematic progression. It should also be kept in mind that basic to Air Force R&D planning is the realization that there is no one "set-

in-concrete" methodology or order of conducting the business of planning. When considering the wide diversity of R&D activity conducted by AFSC, we believe that planning must be flexible. This necessitates different planning approaches for different portions of the R&D spectrum. In this context Figure II shows the general path of R&D planning and the basic steps by activity or organization. It must be recognized that to look at this path as having a definite starting point at the research activity is seldom, if ever, correct. The path indicated can be entered at almost any point. It would not be entirely impossible, however, to follow a concept or idea generated from the research activity along the entire path indicated until it formed the whole or a part of the Development Directive.

Starting with the research inputs, these plus the results of in-house study efforts give us the technology base which in turn is translated by AFSC into a usable form for the determination of our Specific Operational Capability (SOC) projection. This SOC is continually updated in terms of the Air Force long-range planning guidance.

The AFSC Technological War Plan (TWP) correlates all the planning ingredients, i.e., research, technology, resources, proposed threat, new ideas, policy and requirements into a single, dynamic, up-to-date expression of AFSC's future course. It is the tool which the AFSC Commander uses to ascertain the status of the command's planning from a total, overall corporate management viewpoint. He can determine which planning areas need more attention, and allocate additional resources to them by shifting relative priorities according to their respective degree of importance and urgency. The commander has approved the concept of the TWP as the primary source of guidance for plotting future courses of action, obtaining resources and providing near-, mid-, and long-range cohesiveness and continuity to Systems Command activities.

As can be seen, the AFSC TWP is a methodology of action as well as a document iterating fact. It encompasses the Headquarters, AFSC planning activity from the initial look at a new concept or new idea to the definition of a system. It treats technology, component and system in a like manner. Proposed activity for any of the above is reviewed to assure such activity is consistent with stated requirements, is compared to alternatives including state-of-the-art as well as other new technology, or supports the determination of new requirements.

The other terms used in Figure II requiring explanation are:

Advanced Development Objective (ADO)—Describes the general characteristics of a new effort designed to (1) fulfill an anticipated long-term operational requirement beyond present technical capabilities and/or (2) exploit a significant technological advancement with a potential military application.

Operational Support Requirement (OSR)—Describes the characteristics of equipment, skills, or techniques required to support Air Force tasks and not identifiable as part of a particular system. Headquarters AFSC is responsible for coordination of draft OSR's to insure they are in consonance with other planning programs and are technically feasible.

Specific Operational Requirement (SOR)—Describes in specific terms the required characteristics of a weapon, command and control, or support system designed to fulfill a near-term operational requirement and contains the most current conceptual guidance.

For the sake of simplicity a number of intermediate steps have been left out of Figure II, e.g., the Contract Definition Phase. What is shown are the basic steps leading up to the purchasing or contracting phase of development projects or, if the project is to be accomplished in an in-house laboratory, to initiation of the project.

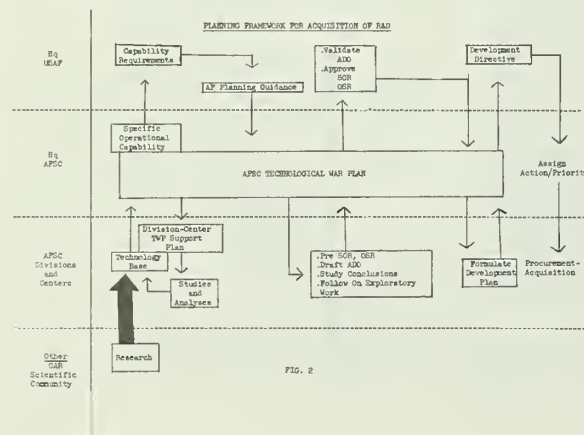


FIG. 2



FROM THE SPEAKERS ROSTRUM



Dr. Albert C. Hall

Excerpts from address titled, "The Military Space Program 1965-1975," by Dr. Albert C. Hall, Dep. Dir. (Space), Office of the Dir. of Defense Research & Engineering, before the Management Session of the Second Annual Meeting of the American Institute of Aeronautics & Astronautics.

* * * * *

Major Areas of Defense Interests in Space

There are three general areas of Defense space interest to which I will speak. These are:

- The exploitation of the space environment for specific military purposes. Included here are such systems as communications, navigation, meteorology and early warning.
- The performance of military tasks by man functioning in the man-machine loop in a satellite. MOL studies have examined the gains and costs associated with the use of man in the performance of tasks in space such as equipment assembly, fine adjustment, maintenance and repair.
- Active direct interest, in close cooperation with NASA and other Government agencies, in fields of space technology, with strong potential defense relevancy. In this area lie booster and reentry technology, satellite stabilization, geodesy and materials research.

Let me speak of this third area first because, while I will devote less time to it in this talk, it is perhaps the most important to the time period that is most difficult to see, namely, the last five years of the ten-year projection I am asked to cover.

In the Department of Defense we categorize most of the work here as research or exploratory development. We employ a different yardstick to measure the programs that we support because there is no sound way to say where a fundamental idea will apply. We spent \$1.5 billion in these two categories this last fiscal year and plan close to the same amount this fiscal year. About 10 per cent of this effort is directly related to space technologies. However, we recognize that our entire research effort can contribute eventual applications in ways that are not always clear. Effective work here is highly important because it lays the groundwork for military systems of the future and it avoids technological surprise.

Another category in which work in general space technology is budgeted is advanced development. If the feasibility or effectiveness of a potentially important idea or proposal needs to be established, the program may be carried out here using somewhat different criteria to control the decision to support the program. The work on flight

tests of gravity gradient stabilization techniques is an example of a project carried on here.

The intent of the Department of Defense, therefore, is to provide flexibility in the yardstick it uses to determine whether an idea is to be supported or not. However, when a program reaches the stage where either a decision to deploy it has been made or such a decision is likely, the program is supported either in the engineering development or operational development budget. Because of the expense and importance of these efforts in those categories, as exact as possible a yardstick is used to determine whether to support the program, and we continue to look for ways to make the yardstick better.

First, we strive to carefully identify the technical, operational and economic factors which tend to influence a determination to embark on a space based military system. Second, we study competitive system approaches, including earth based systems. By going through this comparison process, we are better able to determine what is important and how it should be measured.

Obviously industry is most interested in the decisions relating to the development of systems that may be operationally deployed, and therefore I believe that it is to both industry's and the Government's interest to understand the measurement process.

Therefore, let me employ an example that is related to others that you may think of yourselves.

One of the earliest suggestions for a practical operating satellite system to accomplish a desired objective of satisfying an earth based need was a system for global navigation. The initial work, supported in the early days by Advanced Research Projects Agency (ARPA), was the outgrowth of work done by William Guier and George Weiffenbach at the Applied Physics Laboratory (APL) of Johns Hopkins University in the very sophisticated analysis of the doppler shift noted from the first Sputnik. The specific suggestion for a possible navigation system based upon the doppler technique was made by Frank McClure of APL.

The detailed system to accomplish global navigation with the aid of special artificial satellites became a recognized program in ARPA in 1959. System development was transferred from ARPA to the Navy in 1960.

The military satellite navigation system became operational in July 1964 and is providing very precise position fixing inputs to a variety of naval units including, of course, the Fleet Ballistic Missile System. The DOD is currently exploring the potential for extension of satellite navigation to other military units which require precise knowledge of position. Satellite navigation appears attractive for use in military aircraft. It would also appear attractive in solving relative position and geographic position ambiguities which are of concern to our anti-submarine warfare forces and attack carrier forces.

In order to understand why we should seriously consider satellites for this function, we may ask ourselves the following questions:

- What military systems require the most precise all-weather position fixing accuracy and to what degree may we accept less accuracy to meet less stringent system needs?
- Who are the potential users, what is the volume of traffic and what is the spectrum of system accuracy needed to be responsive to user requirements?
- What limitations are there with regard to frequency of position fix demand by multiple users?

• How secure must the system be? Does it provide a passive mode so that its employment does not unmask the positions of the user?

• Does the system offer capabilities beyond position fixing such as limited communications and traffic control potential. What does it mean to incorporate such a feature in terms of satellite power, band-width, multiple access and the ability to use small compact ground or seaborne terminals and antenna systems? Must the functions be coupled or can they be decoupled?

• Will foreign basing of ground elements of the system be required and how could this requirement affect system selection?

• Is it cost effective when compared with other earth-based systems in being or under development? And, of course, is it operationally attractive.

It is generally recognized that artificial earth satellites have potential for providing a reliable means of obtaining a position fix under all weather conditions and several systems seem to be technically feasible. The doppler shift technique, used in the current Navy operational satellite is one approach; range measurement obtained through one or more satellites is another; and measurement of range and angle by means of interferometer technique is another.

Let us consider the kinds of position fixing that military needs may place on navigation systems. Mobile strategic systems such as the manned strategic bomber and the Fleet Ballistic Missile System demand very high accuracy and measurement in suitable coordinates. Mobile tactical missile systems and the position fixing requirements for anti-submarine warfare; naval gunfire support and field artillery support may require even higher accuracy and target location in relative coordinates. Finally, there are a large number of logistic needs, aircraft and ships, which require very high navigation accuracy at the terminal points but much less accuracy in mid-course range.

A challenge for industry could be the design and fabrication of a cost-competitive space system which, when coupled with a variety of ground-based segments, would provide the degree of accuracy required by multiple users at costs commensurate with individual user needs. From a military point of view such a system should be capable of use in a simple, foot soldier man pack; an aircraft; a tank; a ship or a submarine, providing the degree of precision pertinent to the mission. There is no single solution to this general problem today. Indeed, a single solution may not be required. Moreover, the importance of certain of the applications is such that particular solutions are worth supporting. Thus, the deployment of the Navy navigation satellite to support the Fleet Ballistic Missile. However, other applications may call for entirely different navigation systems and indeed non-satellite systems may be better. . . .

A Challenge for Exploiting Satellites in Relative Location and Tactical Application

The preceding discussion illustrates that there are competitive factors to be weighed in considering satellites for position fixing applications. Nevertheless, there are many applications in which high accuracy in relative coordinates is badly needed.

Let me identify some of the applications:

• Air and surface target coordination between multiple units. This includes close air support, interdiction and ASW.

• The spotting in local map coordinates of landing and artillery units.

• Over the horizon shore and tactical ballistic missile bombardment.

• The determination of land and sea target coordinates to fire control accuracies by aircraft photo-mapping methods.

• Tactical coordination and control of carrier operations.

• The scheduling and control of amphibious and combat ground forces including the mobile army.

• Rendezvous at sea replenishment operations under radio and radar silence.

• The scheduling and control of ordinary air traffic and ship movements across broad ocean areas.

The choice of space designs for any of these needs, however, should consider the type of competitive question exemplified above.

Manned Military Systems

Among the interesting and challenging questions facing the Department of Defense today is the one relating to the potential role of manned spacecraft for military missions. We have examined these questions in detail for some time now during the course of the Manned Orbiting Laboratory study and have gained a much better understanding of the ways man may be useful in space. This understanding has been influenced by several factors. First, is the extensive and successful manned space program of NASA in which the military participates broadly in such areas as ground facilities, recovery, launch vehicles, astronauts and specific military experiments. Second, the results of the military space program have provided us with a better appreciation of the advantages and limitations related to unmanned satellites. DOD has launched hundreds of unmanned satellites. DOD has launched hundreds of unmanned spacecraft with application to all credible military tasks. Third, studies of possible situations in which a manned spacecraft may be preferred to an unmanned vehicle. An examination of this latter factor may be of interest to you.

The Importance of Man

We have recognized for some time that in space man's ability may be particularly significant in tasks such as:

- Equipment assembly.
- Fine adjustment of equipment.
- Adaptive mission programming.
- Maintenance and repair.
- Data screening.
- Selective reporting.

However, let me say that we have not discovered any military missions which are absolutely unique to the manned mode. We do find circumstances where it appears that the manned mode offers quantitative improvements in the effectiveness of the mission compared with the unmanned mode. However, we cannot, in planning expensive programs, proceed on the intuitive belief that man may find something to which his special abilities will apply.

Our unmanned experience tells us that it is likely that only complex tasks will require a man in space. However, it should also be recognized that complex missions may be difficult to do with a small group even though they be specially trained. Take the launch operation of the Titan II-Gemini as a current example: There are over 100 mission support people not directly involved at Cape Kennedy, there are almost 350 personnel involved with the spacecraft at the Cape and the launch crew itself numbers 165 people. Total highly educated and highly skilled people involved in one Gemini launch operation to support two astronauts is over 600. . . .

Now let me review briefly factors affecting the cost of manned missions. The Mercury spacecraft, for example, weighed 3,000 pounds and sustained one man in space for three days. Except for the man himself, there was no room for useful experiments. The Gemini spacecraft weighs 7,000 pounds and is capable of sustaining two men for about 7-14 days. Here again, useful space to perform meaningful experiments (again excluding man himself as an experiment) is limited to a few hundred pounds.

We have found that a manned spacecraft requiring two men on orbit for 30 days dictates that almost 20,000 pounds of orbital weight be allocated exclusively for their support in orbit and return to earth without contributing to the discretionary payload. Included here is at least 400 cubic feet of unencumbered pressurized free space per man to function in a well protected shirtsleeve environ-

ment. Allowances must be made for an exercise area as well as functional work and housekeeping areas. Finally, not to be forgotten is the need to carry along several thousand pounds of useful experiments.

A typical mission cost for delivering a multi-manned satellite in low earth orbit can be estimated. For example, the launch vehicle may be \$15-20 million, the return vehicle may cost between \$10-20 million, a payload of 5-10 thousand pounds of equipments, if past experience is a guide, may cost \$5-10 million, on orbit support may add about \$10 million and, finally, recovery force deployment and operations have been estimated at \$5-10 million. Total mission cost, then, could be between \$45-70 million per mission.

On the other hand if the same mission could be achieved by automatic equipment programmed from the ground, one could afford to raise the equipment weight from 5-10 thousand pounds to 25,000 pounds, and increase the payload investment from \$5-10 million to perhaps \$20 million without exceeding the investment devoted to the manned system. On the other hand, on orbit equipments weighing 25,000 pounds even with redundancy may require man servicing to keep them operating. It seems clear then that manned space systems must involve complex functions with ultimate relations provided between man and the equipment to prove effective.

The area in which man may pay for his place in space is his ability to cope with the unexpected, but the possibilities must still be largely foreseen and provided for to permit a limited crew, with limited facilities, to handle the situations that may arise.

In summary, then, manned space flight undertakings will be expensive, and the payloads which man will accompany into orbit must justify his presence in the man-machine loop in orbit if the manned system is to be cost competitive. These payloads and the launch vehicle systems which will place them in orbit are expensive, complex mechanisms. They will require the concentration of some of our scientific and engineering manpower for a long-period. The value of the mission clearly must rest on the necessary presence of man in the satellite.

Conclusions

I have attempted in the short time allotted to me to describe how the Department of Defense views space systems and their development in the light of (1) Defense space interests, (2) what we consider important and how we measure it and (3) how we view the manned versus unmanned question.

Let me close by projecting the military space program into the future in general terms.

It is likely that military interest will remain focused primarily on near-earth missions, out to synchronous orbit, certainly through 1975. We expect to continue our very large and vigorous unmanned military space program which is performing very important functions. The need for these programs will not diminish since they are by far the most efficient and cheapest way of performing specific tasks. With a steadily increasing experience and know-how in manned space flight, we may expect that spacecraft will acquire characteristics permitting rendezvous, station-keeping, docking and transfer of man and material. We will likely acquire the means of sustaining military men in space for the periods of time we require. Booster capacities are not likely to limit the applications, but the booster and payload costs will continue to do so.

There is nothing hostile or aggressive in the military space program we foresee. It is entirely within the context of a national program expressly devoted to peaceful purposes. As the President has stated on many occasions, "It is understood that the United States does not have a division between peaceful and non-peaceful objectives in space, but rather has space missions to help keep the peace and space missions to improve our ability to live in peace.



Lt. Gen. A. D. Starbird, USA

Excerpts from address titled, "Our Changing Strategic Communications," by Lt. Gen. Alfred D. Starbird, USA, Director, Defense Communications Agency, before the Armed Forces Communications Electronics Association.

* * * * *

Let me speak now on some of the more critical hardware trends which I believe will continue to be of particular interest to the Government.

- I mentioned earlier the effort under way in automatic switching. Unfortunately most of the Government agencies' switching programs were started before the National Communications System (NCS) concept of linking together became critical. Each of these agencies is now trying to adapt its equipment and procedures to be compatible one with the other. Industry could help tremendously if in future proposals it will bear in mind this necessity for the interplay of all NCS subsystems.

- If we are to avoid increasing tremendously our costs, as the increasing traffic requirements which are a certainty fall upon us, we must have ways of effecting maximum loading on our transmission and switching backbone. Therefore, all of us with the Government are interested in any equipments which will help in this regard, those which will give us highest data rates for the band width available, those which reduce errors and re-runs and those which permit rapid voice/data alternate use. And in this latter regard, we want the help of all in overcoming parochial barriers that prevent complete flexibility for alternate voice/data transmission.

- The cable circuits which commercial carriers have brought in have improved tremendously our communications to new areas of the world. Then, too, all of us are delighted at the new Communications Satellite Corporation's successful Early Bird, which opened a new, wide-band, trans-oceanic horizon. Yet in spite of the cables, and the planned COMSAT additions, it will be many, many years before all sections of the world will be adequately reached. As of the present, some 75% of the capitals of the Free World can be contacted only by lower dependable, high frequency radio. And planned commercial resources will not improve this situation greatly for many, many years to come. This is an enigma—and a dangerous one—at a time when diplomatic and military events repeatedly require that the most remote areas be reached rapidly. It is this need to reach reliably even the more remote locations that has led the Government to conclude that it must develop a Defense Communications Satellite System to serve limited, but vital and unique, national security requirements. The Defense Communications Satellite System, working with small ground terminals, would enable us to install in a matter of hours minimum but reliable communications to any new area. With its special security features, it will give us also a more survivable thin-line net for command even under a condition of attack.

• While speaking of the various transmission media, I should add a word about two long-haul types I have not earlier discussed—tropospheric scatter and high frequency radio. The Government has installed in the last five years rather mammoth scatter systems crossing the North Atlantic, traversing much of the Pacific and criss-crossing Europe. Additions to these will be made, but these additions will be primarily in the nature of upgrading rather than the adding of backbone routes.

• We will continue to place heavy reliance for many years to come in our strategic communications on high frequency radio. The Government operates at the present time over 250 point-to-point trunks, of several thousand circuits—primarily to remote locations or as back-up along critical, high reliability routes. I do not look for a major increase in the number of such strategic high frequency point-to-point trunks. In fact, the number should decrease slowly with time. I should stress, however, the decrease will be gradual and every effort will be made to upgrade the residual trunks to higher reliability. We are very interested, therefore, in means of accomplishing such improvements where the cost is not prohibitive.

• Most of the equipment measures that I have mentioned so far apply to the long-haul media itself. Yet it does no good to transmit information instantaneously end-to-end only to have that information bog down in the digestion and distribution process. And we are having indigestion. As a bicarbonate, we are carrying on increasing effort to introduce automation in our information and distribution centers. However, much more is needed in inventiveness at these terminal ends. This, to me, is an open field for invention and development.

In closing, let me re-emphasize that I know that the traffic volume and transmission quality required in our strategic systems will continue to increase tremendously with time. Only by understanding and inventiveness on the part of the Industry-Government team can these requirements be adequately fulfilled. Yet these increasing needs must be fulfilled if we are to maintain our national security and economic pre-eminence.

Automatic Data Field Systems Command Activated

The Automatic Data Field Systems Command (ADFSC) is the newest organization of the U.S. Army Combat Developments Command (CDC) and U.S. Army Materiel Command (AMC). Located at Fort Belvoir, Va., the new command replaced the CDC Command Control Information System Group and the AMC CCIS-70 project.

The mission of the new command is to manage the efforts and resources set forth in the Department of the Army Implementation Plan for "Automatic Data Systems within the Army in the Field."

Included in the ADFSC are an Army Augmentation Element at the U.S. Air Force Joint Systems Program Office, Wright-Patterson AFB, Ohio; the Automatic Data Field Systems Design Agency, Fort Huachuca, Ariz.; and offshore activities which will be responsible for introduction of new equipment and assisting in systems design and experimentation in overseas areas.

Brigadier General Roger M. Lilly commands the new organization.

Deep Submergence Rescue Vehicle

(Continued from page 2)

- Outboard-hung propeller pads.
- Cycloidal propellers.
- Fluid jet control.
- Conventional propeller with tail fin and side thrusters.
- Tandem propellers.
- Stern propeller with controllable ring tail surface and transverse thrusters both fore and aft (as in Figure 2).

The following factors were of prime importance in selecting the propulsion system:

- Power required to develop thrust.
- Thrust efficiency.
- Size and weight.
- Mechanical complexity.
- Control flexibility.
- Space envelope.

The outboard propeller pads and cycloidal propeller systems would have provided a highly maneuverable vehicle. However, these systems were eliminated principally because they required detachment for air transport and were susceptible to damage or fouling with underwater cables or debris.

The single screw propeller with controllable ring tail shows promise of providing excellent performance. Hovering control in pitch, yaw, sway and heave is provided by a pair of thruster ducts located at the bow and stern. Roll control is provided by a mercury trim system. This combination of propeller and thrusters will provide dynamic control in five degrees of freedom. The tandem propeller concept is also being considered for the potential propulsion system. This system would provide excellent low speed maneuvering capability with dynamic control in six degrees of freedom. Additional model and simulator studies are being conducted in order to choose the most optimum propulsion system.

Figure 3 indicates the many types of sensors required to successfully accomplish a search and rescue mission. It is obvious that the location of these sensors are closely interrelated with the design and the functional effectiveness of the vehicle.

I would now like to describe the "electronic brain" of the rescue vehicle. There are at least eight principal functions that will have to be accomplished during a mission cycle:

- Take-off and landing on mother submarine.
- Navigation.
- Communication.
- Sonar search.
- Hovering control.
- Television viewing.
- Manipulator control.
- Mating to sunken submarine.

It is obvious that two operators would have a difficult time performing all these functions if separate controls and displays were used. We, therefore, are developing an integrated control which will readily permit two men to operate this vehicle. All sensors, navigation and propulsion equipment will provide electrical signals into a computer and common display. Thus, to control the vehicle the operator will merely command a direction and velocity and the computer will transmit control signals to the individual propulsion and control units. Without such a control system, it would be exceedingly difficult, if not impossible, to perform a submerged mating operation under adverse conditions of attitude and current.

We have completed the preliminary design of the first prototype rescue vehicle and have recently issued a Request for Proposal to industry for the design and fabrication of this vehicle. We expect to issue a contract award by late 1965 and begin fabrication by July 1966. An at-sea operational capability of this vehicle is expected by the end of 1968.

Present plans call for five tactical vehicles to be constructed, one to be awarded in FY 1967 and four in FY 1968. By 1970, the Navy will have a new world-wide rescue system, capable of reaching a disabled submarine within 24 hours after receipt of the distress signal.

Perhaps even more significant is the fact that our new deep rescue vehicles will open the frontiers of Inner Space. We can indeed look forward to a new generation of deep-sea craft which will be capable of exploring the heretofore non-reachable ocean depths.



MEETINGS AND SYMPOSIA

OCTOBER 1965

Ninth Annual Organic Chemistry Conference, Oct. 5-6, at Natick, Mass. Sponsor: Army Natick Laboratories. Contact: Dr. Louis Long, Jr., Asst. Head, Organic Chemistry Laboratory (PRD), Army Natick Laboratories, Kansas St., Natick, Mass.

J. M. Burgers' 70th Anniversary Symposium on the Dynamics of Fluids and Plasmas, Oct. 6-8, at the University of Maryland, College Park, Md. Sponsor: Air Force Office of Scientific Research. Contact: Mr. P. A. Thurston (SREM), Air Force Office of Scientific Research, Tempo D, 4th St. and Independence Ave., S.W., Washington, D. C. 20333, telephone (Area Code 202) OXford 6-3442.

1965 Congress of the International Federation for Documentation (FID), Oct. 7-16 at Washington, D. C. Sponsors: Air Force Office of Scientific Research, Office of Naval Research, Army Research Office, National Science Foundation and Council on Library resources. Contact: Rowena Swanson (SRIR), Air Force Office of Scientific Research, Tempo D, 4th St. and Independence Ave., S.W., Washington, D. C. 20333, telephone (Area Code 202) OXford 6-5374.

International Conference on Dynamic Stability of Structures, Oct. 18-20, at Evanston, Ill. Co-sponsors: Air Force Office of Scientific Research and Northwestern University. Contact: Professor George Herrmann, The Technical Institute, Northwestern University, Evanston, Ill. 60201.

Photovoltaic Specialists Conference, Oct. 18-20, at NASA-Goddard Space Flight Center, Greenbelt, Md. Sponsors: American Institute of Aeronautics, Institute of Electrical and Electronics Engineers and the Air Force Propulsion Laboratory. Contact: J. Wise (APIP-2), Wright-Patterson AFB, Ohio, telephone (Area Code 513) 253-7111, ext. 3-5127 or 2-0186.

1965 Annual Conference on Nuclear Science, Oct. 18-20, at San Francisco. Co-sponsors: Institute of Electrical and Electronics Engineers Group on Nuclear Science and the Air Force Office of Scientific Research. Contact: Dr. D. G. Samaras (SREP), Air Force Office of Scientific Research, Tempo D, 4th St. and Independence Ave., S.W., Washington, D. C. 20333, telephone (Area Code 202) OXford 6-3769.

Matric Method & Structural Mechanics, Oct. 26-28, at Wright-Patterson AFB, Ohio. Sponsor: Air Force Flight Dynamics Laboratory. Con-

tact: J. Steward (FDE), Wright-Patterson AFB, Ohio, telephone (Area Code 513) 253-7111, ext. 2-3120.

Thirty-fifth Shock and Vibration Symposium, Oct. 26-28, at the Jung Hotel, New Orleans, La. Sponsor: NASA. Contact: Mr. W. W. Mutch, Shock and Vibration Information Center, Code 4021, U.S. Naval Research Laboratory, Washington, D. C. 20390.

NOVEMBER 1965

V/STOL Symposium, Nov. 3-4, at Wright-Patterson AFB, Ohio. Sponsor: American Helicopter Society. Hosts: Aeronautical Systems Div., Research and Technology Div. and Systems Engineering Group. Contact: George Dausman, Wright-Patterson AFB, Ohio, telephone (Area Code 513) 253-7111, ext. 2-5104 or 2-3164.

Incentive Contract Workshop, Nov. 13, at Cape Kennedy, Fla., and by closed circuit TV at Orlando, Daytona Beach, and Gainesville, Fla. Sponsor: National Contract Management Assn. Contact: Mr. Donald Hocking, P. O. Box NCMA, Cape Kennedy, Fla. 32920, telephone (area code 305) 853-3940.

Fourth Hypervelocity Techniques symposium, Nov. 15-16, at Arnold Air Force Station, Tenn. Sponsors: Arnold Engineering Development Center, ARO, Inc., and Denver Research Institute. Contact: J. Lukasiewicz, Arnold Air Force Station, Tenn., telephone (Area Code 615) 455-2611, ext. 7204 or 7205.

Fourth Annual Symposium on Physics of Failure in Electronics, Nov. 16-18, at the Illinois Institute of Technology Research Institute. Co-sponsors: Rome Air Development Center and the Illinois Institute of Technology Research Institute. Contact: Joseph Schram (EMERP), Rome Air Development Center, Griffiss AFB, N. Y., telephone (Area Code 315) FF6-3200, ext. 2813.

DECEMBER 1965

Fourteenth Annual Wire and Cable Symposium, Dec. 1-3, at the Shelburne Hotel, Atlantic City, N. J. Sponsor: Army Electronics Command. Contact: Milton Tenzer, Symposium Chairman, Electronic Parts and Materials Div., Army Electronics Laboratory, Fort Monmouth, N. J. 07703, telephone (Area Code 201) 535-1834.

International Symposium on Differential Equations and Theory of Systems, Dec. 27-30, at the University of Puerto Rico. Sponsors: Air Force Office of Scientific Research, Brown University and the University of

Puerto Rico. Contact: Maj. B. R. Agins (SRMA), Air Force Office of Scientific Research, Tempo D, 4th St. and Independence Ave. S.W., Washington, D. C. 20333, telephone (Area Code 202) OXford 6-1302.

JANUARY 1966

Research Effectiveness as Related to Vehicles, Jan. 28-29, at Detroit, Mich. Sponsor: Department of the Army. Contact: Paul D. Denn, Chief, Research Div., U.S. Army Mobility Command, Warren, Mich., telephone (Area Code 313) 756-1000.

International Symposium on Information Theory, Jan. 31-Feb. 2, at the University of California at Los Angeles, Los Angeles, Calif. Co-sponsors: Air Force Office of Scientific Research and the Information Theory Group of the Institute of Electrical and Electronics Engineers. Contact: Prof. J. Carlyle, UCLA, Los Angeles, Calif., telephone (Area Code 213) 478-9711, ext. 7181.

MARCH 1966

Conference on Space Maintenance and Extra-Vehicular Activities, March 1-3 at Orlando, Fla. Sponsor: Air Force Systems Command's Aero Propulsion Laboratory, Wright-Patterson AFB, Ohio. Contact: Chester B. May, Aero Propulsion Laboratory, Wright-Patterson AFB, Ohio.

Conference on Functional Analysis, March 28-April 1, at the University of California, Irvine, Calif. Co-sponsors: Air Force Office of Scientific Research and the University of California. Contact: R. G. Pohrer (SRMM), Air Force Office of Scientific Research, Tempo D, 4th St. and Independence Ave., S.W., Washington, D. C. 20333, telephone (Area Code 202) OXford 6-5248.

Second International Symposium on Aerobiology, March 29-30, at Chicago. Co-sponsors: Department of the Army and Illinois Institute of Technology Research Institute. Contact: Elwood K. Wolfe, Director of Technical Services, Fort Detrick, Frederick, Md., telephone (Area Code 301) 663-4111, ext. 2214.

Bionics Symposium 1966, dates undetermined, at Sheraton Hotel, Dayton, Ohio. Sponsors: Aerospace Medical Research Laboratory, Aerospace Medical Division, and Avionics Laboratory, Research and Technology Division. Contact: Dr. H. L. Oestreicher (MRBAM), Aerospace Medical Research Laboratory, Wright-Patterson AFB, Ohio, telephone (Area Code 513) 253-7111, ext. 3-6108.

CALENDAR OF EVENTS

Oct. 11: National Aerospace Services Assn. Annual USAF Contract Aerospace Services Symposium, Dayton, Ohio.
 Oct. 19-20: Electronic Industries Assn. Systems Effectiveness Conference, Sheraton - Park Hotel, Washington, D. C.
 Nov. 2-5: Annual Industrial Trade Fair, Los Angeles, Calif.
 Nov. 2-5: Data Processing Management Assn. Meeting, Dallas, Tex.
 Nov. 7-11: National Electrical Manufacturers Assn. Meeting, Washington, D. C.
 Nov. 7-12: American Society of Mechanical Engineers, Chicago, Ill.
 Nov. 8-10: American Petroleum Institute Convention, Chicago, Ill.
 Nov. 10: 190th Anniversary of U. S. Marine Corps.
 Nov. 15-19: American Nuclear Society Meeting, Washington, D. C.
 Nov. 15-19 Atomic Industries Forum, Washington, D. C.

Nov. 17-19 Industrial Management Society Meeting, Chicago, Ill.
 Nov. 20: Artillery Firepower Demonstration, Fort Sill, Okla.
 Nov. 29-Dec. 3: Chemical Industrial Exposition, New York, N. Y.
 Nov. 30-Dec. 2: Electric Industries Assn. Meeting, Los Angeles, Calif.
 Dec. 6: National Aerospace Services Assn. Army Aviation Contract Services Symposium, Washington, D. C.
 Dec. 8-9: National Security Industrial Assn.-Air Force Systems Command Microelectronics Conference, Washington, D. C.

CORRECTION

The location of the American Ordnance Assn. Equipment Manual Symposium was incorrectly listed as Washington, D. C. It will be held at the Statler Hilton Hotel, Dayton, Ohio.

Additional DCAS Regional Offices Established

Two new Defense Contract Administration Services Region offices were opened in August in Boston, Mass., and Cleveland, Ohio, to help military buying agencies complete work on defense contracts.

A New York Region office is scheduled to be activated Nov. 1 and Los Angeles and San Francisco regions will begin operations Dec. 1.

The new offices will bring the total number of regional units to eight with offices already established by the Defense Contract Administration Services (DCAS) in Philadelphia, Detroit and Dallas. Three more are planned for the future.

Work performed by the regional offices includes pre-contract award surveys of contractors' facilities and financial status, quality assurance, security clearance for plants and personnel, payments to contractors and similar functions required by the Government during the manufacture and maintenance of defense materiel.

Commanded by Colonel Frank A. Bogart, USA, the Boston Region has responsibility for providing contract

administration services in Vermont, Maine, Rhode Island, Massachusetts, Connecticut, New Hampshire and New York (except those areas under the jurisdiction of the New York office).

The Boston Regional office is located at 666 Summer St., Boston. Two subordinate Defense Contract Administration Services Districts are located in Hartford, Conn. and Rochester, N. Y.

Colonel Norman T. Dennis, USA, directs the operation of the Cleveland Regional Office which is located at 1367 East Sixth St. The Cleveland office is responsible for providing contract administration services in Kentucky and Ohio as well as Crawford, Erie and Mercer Counties in Pennsylvania.

Heading the New York Region will be Brigadier General Clarence W. Clapsaddle, Jr., USA. The New York District will include New York City, Long Island, the New York counties of Orange, Putnam, Rockland, Westchester and the New Jersey counties of Middlesex, Monmouth, Somerset, Hunterdon and all counties north.

AUSA Annual Meeting Scheduled in October

The 1965 annual meeting of the Association of the United States Army (AUSA) will be held October 25, 26 and 27 at the Sheraton Park Hotel, in Washington, D. C. More than 3,500 officers, enlisted men and Army-interested civilians from all parts of the United States and from overseas are expected to attend the meeting.

Secretary of the Army Stanley R. Resor will deliver the meeting's keynote address on Oct. 25 and Army Chief of Staff General Harold K. Johnson is scheduled to speak before the annual AUSA Luncheon on Oct. 26.

The program will include presentations on Air Mobility, the Army's Role in Stability Operations, Army Operations in the Dominican Republic, Combat Developments and Reserve and ROTC Affairs.

More than 60,000 square feet of space will be taken up in the hotel for exhibits by industry reflecting the latest scientific and technical advances in the military field. An additional 30,000 square feet of Army exhibits and items of Army equipment is planned.

The annual George Catlett Marshall Memorial Dinner will take place on the evening of the last day of the meeting.

Registration will begin at the hotel at 11 a.m., Oct. 24. Advance registration information may be obtained by writing the Association of the United States Army, 1529 18th Street, N.W., Washington, D. C. 20036.

Small Business Workshop to be Held in Philadelphia

The Department of Defense, joined by the National Security Industrial Association and the Department of Commerce, will hold a Small Business/Labor Surplus Area Workshop for approximately 20 prime contractors located in the Philadelphia Defense Contract Administration Services (DCAS) Region in Philadelphia on October 19, 1965.

The purpose of this one-day workshop is to conduct a Government/industry discussion of the DCAS organization and concept of operation, and recent changes in small business and labor surplus programs related to set-asides and subcontracting activities.

Future workshops are planned for each of the remaining DCAS regions with dates to be announced later.

BIBLIOGRAPHY

DOD Directive 7600.2, "Department of Defense Audit Policies, Aug. 19, 1965. Prescribes basic policies with respect to internal and contract audit in the DOD, and sets forth organizational responsibilities for carrying out the audit functions.

DOD Directive 5220.22, "Department of Defense Industrial Security Program," July 30, 1965. Updates the DOD Industrial Program (DISP) by realigning and delineating responsibilities and functions connected with (1) the DOD Industrial Security Manual (ISM) and the DOD Industrial Security Regulation (ISR) and (2) security cognizance under the DISP.

DOD Directives may be obtained from:

Publications Distribution Branch
Office of the Secretary of Defense
Room 3B 200, The Pentagon
Washington, D. C. 20301

Weekly Compilation of Presidential Documents. This new service makes available transcripts of the President's news conferences, messages to Congress, public speeches and statements and other Presidential materials released by the White House up to 5 p.m. each Friday. The Weekly Compilation carries a Monday date line.

Subscription price: \$6.00 a year.

1965-66 United States Government Manual. Official organization handbook of the Federal Government.

Catalog No. GS 4.109:965 \$1.75

Selling to the Military. This pamphlet provides business firms basic steps and initial contacts for locating sales opportunities in the Department of Defense. It gives information on items purchased and locations of military offices. Rev. 1965.

Catalog No. D 1.2:Se4/965 35¢

Army Procurement Procedure. Prescribes policies, procedures and standards governing the procurement of supplies and services by the Department of the Army. Revised April 1, 1965.

Catalog No. D 101.6/4:965 \$2.00

Publications that require remittance are available for purchase at U.S. Government Printing Office, Washington, D. C. 20402.

Order AD 617 337N Inelastic Buckling Tests of Ring-Stiffened Cylinders Under Hydrostatic Pressure, Navy

David Taylor Model Basin, Washington, D. C., May 1965, 42 pp., \$2.00.

Order AD 615 723N The Effects of Continuous Vibration of Concrete During Initial Set, University of Arizona for the Air Force, April 1965, 74 pp., \$3.00.

Order AD 616 098N Continuous Measurement of Solid Propellant Burning Rates, Jet Propulsion Center of Purdue University for the Air Force, Feb. 1965, 58 pp., \$3.00.

Order AD 617 107N A Review of Hypersonic Wake Studies, RAND Corp., for the Advanced Research Projects Agency, May 1965, 89 pp., \$3.00.

Order AD 617 759N Trends in Hard Materials: Report of Task Force No. 3 of the Ad Hoc Machine Tool Advisory Committee to the Department of the Air Force, Air Force Jan. 1965, 33 pp., \$2.00.

Government research and development reports are available to science and industry at:

Clearinghouse for Federal and Scientific Information
Department of Commerce
Springfield, Va. 22151

Employers Asked to Help Keep Young Americans in School

Acting in support of President Johnson's campaign to get young Americans to return to school, Secretary of Commerce John T. Connor appealed to employers nationwide to assist in every way possible in a Youth Opportunity back-to-school drive.

In announcing the campaign on August 21, the President called upon employers, unions, civic, trade and religious organizations and state and local governments to "exert every influence that they command to bring our young people facts on the importance of education."

"The President and I are asking two things of you," Secretary Connor said in an open letter to 6,000 employers.

"First, do everything possible to influence the youngsters in your community to go back to school this fall and to complete their education, and

"Second, provide as many school year part time jobs for youths as possible, especially in those cases where such a job might spell the difference between finishing school or dropping out."

AFLC Establishes Five Long Supply Assets Offices

The Air Force's Logistics Command (AFLC) has established offices at five air materiel areas to help manage the multi-million dollar "long supply" assets of the command.

The new offices have been set up primarily to uncover additional or increased uses for surplus Air Force equipment which has no immediate planned need.

New offices are located at Middletown, Sacramento, San Antonio, Ogden and Oklahoma City Air Materiel Areas.

Objective of the program is to increase the use of assets by placing a human control point in the computerized exchange of long supply goods between Federal Government agencies and AFLC.

A 90-day pilot program was recently conducted at Robins AFB, Ga., in which the Material Utilization Control Office concept, as it is called, was studied. In the test, \$15.5 million of long supply assets were made available to other users by the Warner Robins Air Materiel Area (WRAMA) for use by Federal agencies. Twelve and one half million dollars in goods from other Government agencies were, in turn, made available to WRAMA.

AF Pamphlet on SEED Program Available

A pamphlet covering the Air Force's new program for the procurement of engineering data for Air Force weapons systems has been prepared and distributed by the Air Force Logistics Command (AFLC).

The program, called "Supply of Essential Engineering Data (SEED)," was designed by the AFLC in cooperation with the Air Force Systems Command. SEED procedures are being tested on the C-141 transport aircraft. The new approach is proving so successful that it will be adopted for all aircraft entering the Air Force inventory. (See article, "New Program for Obtaining Blueprints Announced by AFLC," *Defense Industry Bulletin*, August 1965.)

The SEED pamphlet is available at Hq, AFLC, Attn: MCK, Wright-Patterson AFB, Ohio, or at any AFLC installation.

Integrated Logistics Support

Cdr. Frank N. Worden, USN
Dir., Supply Management Policy Branch
Bureau of Supplies & Accounts
Department of the Navy

Industry and the military services must consider supply management early in the conceptual phase of weapons support by designing a logistic support system concurrently with the development of the hardware to provide the integrated support necessary for the weapons system manager. A merging of maintenance and supply information subsystems is necessary for effective material support to provide analysis required by program managers. Managers must receive this type of data from the supply system design to minimize support costs.

The references listed in the bibliography have been freely plagiarized for this article. The author desires that the subject matter receive the attention of as many professionals in supply management as possible.

Like astronauts walking in the unfamiliar environment of outer space, industry and the Military Services are testing the environment of "integrated logistic support." Not all of the concepts are new, but in today's management world of technical supply—replete with such terms as maintainability, supportability and reliability—we are experiencing first hand new complexities in the solution of our material support problems.

Our new environment has been created by the publication of DOD Instruction 4100.35 of June 19, 1964, (affectionally known as "Point Thirty-five"). This instruction establishes policies and objectives governing the systematic and orderly development of integrated logistic support for both systems and equipments.

Integrated logistic support has a far-reaching impact on both the military and the industrial complex of our nation and we should understand the significance of this concept on our respective roles. The impact may initially be the embryo of revised contractual relationships; it could grow into a dictionary for the definition of tasks and evolve finally as the patriarch for the assignment of missions and duties.

Elements of Integrated Logistic Support

Integrated logistic support is a composition of the elements necessary to assure the effective and economical support of a system or equipment at all levels of maintenance for its programmed life cycle. It is important to recognize that a balance of the elements involved is necessary. These elements include planned maintenance, logistic support personnel, technical logistics data and information, support equipment, spares and repair parts, facilities and contract maintenance.

Note that the selection of spares and repair parts is but one element of integrated logistic support. Their selection must be balanced against the requirements of all other elements. Perhaps the most significant aspect of this concept, as it applies to the management of spares and repair parts, is that the planned maintenance element requires decisions as to what will be repaired, who will repair it, when and where it will be repaired and how it will be repaired.

These decisions are made by the project manager early in the chronology of events as inputs to technical development plans and budget requirements. Once these decisions are made, the selection of the range and quantity of items (i.e., supply and repair parts, special tools, test equipment and support equipment) required to support and maintain an item for an initial period of service (defined as "provisioning" in DOD instructions) is, in a sense, predetermined.

Maintainability a Key

Planned maintenance can be accomplished most effectively when the relatively new concept of maintainability is considered. The concept of maintainability requires an integration of design and maintenance engineering effort to provide controls which help or assure the manager that he has a system or an item of equipment that not only meets performance requirements but also one that can be supported expeditiously and economically.

Maintainability is the design parameter that facilitates integration of support considerations during the conceptual phase of weapon development and helps provide a means for the orderly and disciplined identification of the hardware, maintenance procedures, personnel subsystem, technical manuals and data, facilities, support equipment, etc., during the definition and development phases of the weapon system.

The development of a system performance and the development of integrated support requirements are paralleling and interrelating efforts from the embryonic period of the system life cycle until it is phased out of the inventory. Performance indices for reliability, accuracy, range, payload ready rate, etc., cannot be considered independently. They must be considered by the project manager together with maintainability to achieve the best overall result. We must obtain the best balance between reliability cost, production cost and support cost. Therefore, these trade-offs must be computed and analyzed as early as possible so that the proper balance can be achieved.

We cannot afford to wait until after a weapon system or piece of equipment has been produced to analyze it for the purpose of determining whether the maintainability is good. This is after the fact. Unfortunately, we have far too many examples of too much emphasis on performance and too little on support of an item or a system.

Such deficiency in program management has resulted in the creation of many costly engineering change proposals, in unsatisfactory provisioning, excessive maintenance requirements, unnecessary special tools, elaborate and complex test and support equipment, poorly written or incomplete technical manuals and inept planning for maintenance personnel.

Maintainability is not just maintenance which, like Topsy, usually grows to fit a design. Maintainability is a systematic, common sense approach to design and is a prerequisite to the development of an integrated logistic support package perfected as the equipment or system is perfected to make sure we won't go broke maintaining it.



Cdr. Frank Worden attended the University of Michigan and was awarded a BBA degree. In 1945 he was graduated from the Navy Supply Corps School at Harvard University and commissioned an ensign in the Supply Corps. Subsequently he served in several assignments in the Supply Corps.

In 1963 Cdr. Worden was awarded an MBA degree from the George Washington University and assigned to the Office of Naval Material. In late 1963, he was transferred to the Bureau of Supplies and Accounts where he is now serving as Director of the Supply Management Policy Branch.

Maintainability, in the context described above, has been with us for only about seven years. It is still a juvenile, but with the "fatherly" backing it received with the publication of DOD Instruction 4100.35 it will not become a juvenile delinquent. As in the case of all juveniles, there is a considerable amount of training to be accomplished. The next seven years, of necessity, will be years of intensified education until the concept is understood, the methodology and procedures perfected and the potential advantages realized. Because of its impact upon decisions for the supply management of technical material, it is important that both industry and the military emphasize the training necessary in this important area.

Management of Technical Material

Because of the inputs required, decisions made for the supply management of technical material are actually a reflection of maintenance decisions. In the past this reflection often has been more of a mirage than reality. Our maintenance planning has not always been well conceived. After-the-fact maintenance decisions have been made when contracts for the equipments to be supported were received.

Arbitrary replacement factors, usually set high because of the human tendency to be on the safe side, have been used. We have been prone to buy for distribution purposes when clear-cut operating requirements were not available. We have, on this basis, often purchased considerably more than subsequent experience proved necessary. Twenty per cent of our technical items are destined for disposal without ever having been issued.

It is a well known characteristic of technical material that the bulk of the demand is concentrated on a relatively few items. In a recent study of Navy aviation items, it was revealed that for 62 per cent of the items sampled, not one system demand occurred for an entire year. A study of cruisers and destroyers in the Atlantic Fleet indicated that 85 per cent of the items carried were not even used once from overhaul to overhaul.

Further, we have not only positioned these items aboard each ship but usually at each echelon of support as well. This type of demand data is not unusual for technical items placed in the supply system in support of maintenance decisions. But in the light of these data, the justification necessary to support additional requirements at the budget table is exceedingly difficult.

Just as significant, estimates made at provisioning (or even before) could result in a critically short supply of a part. The error may be actually one in equipment design, failure to consider operating requirements, or perhaps one which is induced in the maintenance cycle. The latter is especially true for new equipments entering the Fleet. As the critical part fails and replacements are not available, equipment down-time increases.

This type of problem may "masquerade" as a supply problem when in actuality it is not a supply problem at all. It must be solved by redesign, changing maintenance concepts, or in some similar manner. Increased investment in parts can, for a time, alleviate the immediate down-town problem, but it may be only an expensive way to treat the symptoms; it may not cure the disease.

It is the thesis of those who would support the concept of integrated logistic support that this investment in inventory does not result in the most economical allocation of our resources. This type of supply problem may be more economically solved in the planning and development stages of equipment design.

A blueprint for logistic support is needed similar to the manner in which the design disclosure drawing is a blueprint for the hardware. This blueprint can be in the form of the Maintenance Engineering Analysis Record (MEAR) or some other similar systematic analysis record to alleviate deficiencies in logistic planning. It also would provide a base on which to build more reliable information as experience data becomes available.

Information System

For truly effective integrated logistic support there must be a free flow of information. Data generated at each decision-making level must flow to the next echelon of

decision making. Just as important, meaningful data must flow "up stream" to the previous decision-making level to verify the accuracy of previous decisions. It is necessary to insure, for example, that design changes are produced where unforeseen maintenance or purchase problems have arisen, and that future design decisions reflect the experience of maintenance or purchase personnel and their contributions to integrated logistic support.

The information system which must be designed to accommodate this concept is one which meets the need of Fleet maintenance personnel, inventory managers, contract officers, training coordinators and contractors, and which is also meaningful to those responsible for design, development and other facets of initial material support. With this necessity for integration it is important that the system design of the information sub-system used for provisioning be compatible with information systems utilized for maintenance control.

Within the Navy, basic information is being provided through the Standard Navy Maintenance Material Management Information System. Data generated by this system must provide the flow up stream to all echelons of management. The information system should be designed to distill and summarize to insure that significant facts are made available at each echelon of decision making. Thus, on an exception basis, management attention can be focused on the more economical allocation of our resources.

The necessity for the flow of this type of information to a contractor providing initial support for a weapon system is also obvious, but this should be a consideration in any contract for the more sophisticated military hardware. We are heavily dependent upon rapid technological improvements to maintain our military superiority. To facilitate engineering decisions which would minimize overall support costs in future designs, language must be placed into our contracts which would eliminate any information barrier.

Adjustment in Emphasis

Accordingly, the impact of maintainability, as utilized in the planned maintenance element of integrated logistic support, on supply management is obvious. The management of technical material, i.e., material held in support of maintenance decisions, requires a change in emphasis directed to a better integration of supply, maintenance and other logistic functions. Some of the functions of supply management that have been useful for supply problems in the past are not as pertinent in the environment of technical supply. For example, the concepts of repetitive demand and random error used to determine reorder points and other quantities become less significant.

Formulae developed on a statistical basis which reflect the probability of random error in demand are seldom as applicable for technical items since, as noted previously, their demand is a function of predetermined maintenance decisions. A large part of our research and improvement efforts in supply has been directed to development of economic order quantities, variable safety levels and similar scientific decision rules. While these have applicability to a small band of technical secondary items and repair parts, they are of little or no significance with respect to the vast bulk of items such as repairables which constitute a large part of our inventory investment. Much of our effort has been devoted to refining functional tasks of supply management. We have made progress within this area of responsibility which, when viewed alone, is impressive. But in approaching the problem of true economy, we must now view these same tasks in the conceptual light of balanced integrated logistic support.

It follows that both industry and the Military Services will be required to utilize new skills for which there is a lack of trained personnel. We must learn to use new management science techniques over and above the old EOQ (Economic Order Quantity)—variable safety level concepts. For example, simulation, using computers, is a basic

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Defense Contract Audit Agency

(Continued from page 5)

ments (Financial Management) and (Installations and Logistics); the Director, Defense Supply Agency, and the Director of the Defense Contract Administration Services, Defense Supply Agency. The Director, DCAA, is required to give an appropriate report to the Defense Contract Advisory Council at least twice each year.

Finally, it is the DCAA Director's intention to meet with representatives of industry associations and contractors from time to time to obtain the benefit of their suggestions as well as hear their gripes, if any, so that constructive improvements can be made and corrective measures can be taken where appropriate.

Facts on Defense Contract Audit Agency

Name: Defense Contract Audit Agency (DCAA)

Location: Cameron Station, Alexandria, Va.

Director: William B. Petty, who is responsible directly to the Secretary of Defense and receives staff supervision from the Assistant Secretary of Defense (Comptroller).

Mission and Functions:

- Audit, examine or review contractors' and subcontractors' accounts, records, documents and other evidence; systems of internal control; accounting, costing and general business practices and procedures.

- Give advice and recommendations to procurement and contract administration personnel on acceptability of costs and estimates of cost to be incurred as represented by contractors incident to the award, negotiation, modification, change, administration, termination or settlement of contracts; adequacy of financial or accounting aspects of contract provisions; adequacy of contractors' accounting and financial management systems, estimating procedures and property controls.

- Assist responsible procurement or contract administration activities in their surveys of the purchasing-procurement systems of major contractors and provide advice and recommendations to the Government management level having authority and responsibility to take action on the audit findings.

- Cooperate with other DOD components on reviews, audits, analyses or inquiries involving contractors' financial positions or financial and accounting policies, procedures or practices.

- Maintain liaison auditors, when appropriate, at major procurement and contract administration offices and provide assistance in the development of procurement policies and regulations.

Organization: Under the DCAA Headquarters at Cameron Station there are seven regional offices. More than 200 branch and resident offices will be located throughout the United States and overseas. Current addresses and telephone numbers of the DCAA regional offices are:

DCAA, Boston Region
424 Trapelo Road
Waltham, Mass. 02154
Phone: (Area Code 617)
TWinbrook 4-2400,
Ext. 613

DCAA, Chicago Region
536 S. Clark St.
Chicago, Ill. 60605
Phone: (Area Code 312)
828-6590

DCAA, New York Region
207 W. 24th St.
New York, N. Y. 10011
Phone: (Area Code 212)
Watkins 4-5000, Ext. 839
DCAA, Philadelphia Region
128 N. Broad Street
Philadelphia, Pa. 19102
Phone: (Area Code 215)
597-7450

DCAA, San Francisco Region
450 Golden Gate Ave.
San Francisco, Calif. 94102
Phone: (Area Code 415)
556-6574

DCAA, Atlanta Region
1776 Peachtree St., N. W.
Atlanta, Ga. 30309
Phone: (Area Code 404)
526-5987

DCAA, Los Angeles Region
1206 Maple Ave.
Los Angeles, Calif. 90015
Phone: (Area Code 213)
688-3506

Navy Long Range Planning Information

(Continued from page 9)

RA-13 Airborne Electronic Countermeasures (SECRET)
RA-14 Airborne Navigation (CONFIDENTIAL)
RA-15 Aircraft Instruments (CONFIDENTIAL)
RA-16 Avionics Supporting Research
RA-17 Terrain Clearance Radar (CONFIDENTIAL)
RA-18 Aircraft Shaft Engines (CONFIDENTIAL)
RA-19 Aircraft Jet Engines (CONFIDENTIAL)
RA-20 Propellers
RA-21 Aircraft Auxiliary Power Systems and Starters
RA-22 Aircraft Fuels and Lubricants
RA-23 High Impulse Propulsion Systems and Electro-mechanical Power Plants for Satellite and Probe Application (CONFIDENTIAL)

Missile Development Office

RM-1 Shipboard Launching Systems and Gun Mount
RM-2 Anti-Air Warhead Technology (Non-Nuclear) (CONFIDENTIAL)
RM-3 Anti-Surface Warhead Technology (Non-Nuclear) (CONFIDENTIAL)
RM-4 Nuclear Weapon Components (CONFIDENTIAL)
RM-5 Guided Missile Fuzes (SECRET)
RM-6 Free Fall Ordnance Weapon Fuzes (SECRET)
RM-7 Cartridge Actuated Devices (CONFIDENTIAL)
RM-8 Biological and Chemical Warfare (SECRET)
RM-9 Pyrotechnics (CONFIDENTIAL)
RM-10 Missile Propulsion (CONFIDENTIAL)
RM-11 Missile Aerodynamics (CONFIDENTIAL)
RM-12 Weapon Ballistics Supporting Research (CONFIDENTIAL)
RM-13 Missile Structures (CONFIDENTIAL)
RM-14 Missile Guidance and Control (CONFIDENTIAL)
RM-15 Surface Weapons Control (CONFIDENTIAL)
RM-16 Airborne Weapons Control (CONFIDENTIAL)
RM-17 Target and Drone Control Systems
RM-18 Range and Shipboard Instrumentation

Research and Engineering Office

RR-1 Reliability, Maintainability and Safety Design Engineering
RR-2 Engineering Data
RR-3 General Use Components
RR-4 Engineering Practices
RR-5 Electromagnetic Radiation Effects on Weapons, Weapons Systems and Electronic Equipment (CONFIDENTIAL)
RR-6 Value Engineering
RR-7 Materials
RR-8 Weapons Sciences (CONFIDENTIAL)
RR-9 Energy Conversion

Ship Installations Office

RS-1 Aircraft Launcher Systems
RS-2 Aircraft Recovery Equipment
RS-3 Visual Landing Aids
RS-4 Ship Installed Aeronautical Facilities (CONFIDENTIAL)
RS-5 Air Launched Weapons Shipboard Systems (CONFIDENTIAL)
RS-6 Ship Launched Weapons Systems. (CONFIDENTIAL)
RS-7 Ship Aeronautical Systems
RS-8 Weapons Packaging and Handling (CONFIDENTIAL)

Astronautics Programs Office

RT-1 Space Defense (SECRET)
RT-2 Satellite Ocean Surveillance (SECRET)
RT-3 Tactical Probes (CONFIDENTIAL)
RT-4 Space Environment (CONFIDENTIAL)

Anti-Submarine Warfare Office

RU-1 ASW Surveillance (SECRET)
RU-2 Classification and Localization (SECRET)
RU-3 ASW Computation and Control (SECRET)
RU-4 Torpedo Component Development & Supporting Research (CONFIDENTIAL)
RU-5 Mine Component Development & Supporting Research (SECRET)
RU-6 Mine Defense (CONFIDENTIAL)
RU-7 Explosives and Explosion Supporting Research (CONFIDENTIAL)
RU-8 Navy Underwater Swimmer Assault System (NUSAS) (CONFIDENTIAL)
RU-9 Explosive Ordnance Disposal (SECRET)
RU-10 ASW Oceanographic Research (CONFIDENTIAL)

Immigrant Aliens Affected by Change in Security Regulation

Defense contractor employees who are immigrant aliens (persons lawfully admitted into the United States under immigration visas for permanent residence) and whose access to classified information is essential in the performance of classified contracts are no longer required to formally declare their intentions to become United States citizens to be eligible for personnel security clearances.

The requirement that the immigrant alien file with the Immigration and Naturalization Service an Application to Execute a Declaration of Intent (Naturalization Form N-300), as now set forth in the Department of Defense Industrial Security Manual for Safeguarding Classified Information (attachment to DD Form 441), dated March 1, 1965, has been deleted effective immediately. An appropriate amendment to the manual is being prepared.

Integrated Logistic Support

(Continued from page 23)

technique to test alternatives before decisions are made. But to use this technique requires skills in mathematics, probability theory and computer soft-ware development. A working knowledge of PERT and PERT Cost to solve complex problems in program management should be a part of the "bag of skills" we can bring to bear on complex problems. Knowledge of statistical techniques, cost analysis and system design is essential. With our dependence upon computers and communications networks for data processing, we must concentrate on the technology in data processing, systems analysis, programming, computer operations and communications. All of these techniques are now in use but we need more military officers with these skills—now, and in the future.

Summary

In summary, in the environment of integrated logistic support, forces are at work which tend to circumscribe the military supply systems of the future. These forces are moving us inexorably from the "art-of-supply" decision rule techniques, which we have developed so thoroughly, to decision techniques which are more constricted by maintenance decisions.

More than ever before we are faced with the diametrically opposed forces of ever increasing costs for the support of our new, more sophisticated weapons systems and limited resource availability. Organizationally, the response has been to place more reliance on birth-to-death management of weapons systems by weapon system managers.

It is in this framework that the concepts of integrated logistic support can flourish more readily; conversely, these concepts support this type of vertical organization. The weapon system manager can, with an information system which keeps him apprised of significant developments at all phases in the life program of his weapon system, use simulation and other available computer techniques to relate data which are essential to employing the concepts of integrated logistic support.

One example is the concept of maintainability. By providing what managers consider the cost of maintenance and related logistic support early in the design and developmental phases, this concept assists the weapon system manager in providing an orderly and disciplined method of allocating his resources over the life program of his weapon system.

One significant feature of integrated logistic support, however, is that decisions which predetermine the range and depth of support items are made long before the supply system is called upon to provision or otherwise support equipments of the weapon system. This will unequivocally change our method of doing business as usual.

In fact, Point Thirty-five presents both industry and the military with a challenge that is far-reaching. We must obtain the expertise and training necessary to participate more fully in the early decisions required of the weapon system manager if we are to remain a valuable instrument of combat readiness.

Our country has a large stake in the implementation of Point Thirty-five, for it charts as unerringly as the navigator's triangle the military logistical course for the future.

Bibliography

1. Fallon, Lt. Col. E.R., Speech on "Maintainability—A Reality, Not a Myth."
2. McDermont, Charles P., Burroughs Corp., Remarks at the Ninth Annual Meeting of the Maintenance Advisory Committee of the National Security Industries Assn. on Oct. 8, 1964.
3. Miller, Clifford J., Bureau of the Budget, Unpublished memorandum of March 6, 1964, on Material Management Programs in the Navy.
4. DOD Instruction 4100.35 of June 19, 1964, subject "Development of Integrated Logistic Support for Systems and Equipment."
5. Office of Naval Material NAVEXOSP-1500.
6. U.S. Applied Science Laboratory, booklet: "Systems Performance Effectiveness Program."

Defense Industry Bulletin Conducts Annual Survey

A survey card is being mailed to all subscribers of the Defense Industry Bulletin. This circularization is required by the Joint Congressional Committee on Printing and must be returned by the Editor on or before Oct. 15, 1965. Subscribers who do not complete the survey card will be removed from the mailing list.

A facsimile of the survey card is printed below. If you have not received your survey card, or are not a regular subscriber to the Bulletin but would like to receive the publication, please clip, fill out and mail the reproduction on this page.

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DEFENSE PROCUREMENT

Contracts of \$1,000,000 and over awarded during month of August 1965:

DEFENSE SUPPLY AGENCY

- 3—Standard Oil Company of California, San Francisco. \$1,546,134. 3,312,925 gallons of lubricating oil. Defense Fuel Supply Center, Washington, D.C.
- Texaco, Inc., New York City. \$1,074,356. 1,634,193 gallons of lubricating oil. Defense Fuel Supply Center, Washington, D.C.
- Chase Bag Co., New York City. \$1,363,622. 7,820,000 burlap sand bags. Defense General Supply Center, Richmond, Va.
- 4—Bern Kane Products, Inc., Brooklyn, N.Y. \$1,792,090. 166,540 locker trunks. Brooklyn. Defense Personnel Support Center, Philadelphia.
- Gulf Oil Corp., New York City. \$5,367,600. 63 million gallons of jet fuel. Defense Fuel Supply Center, Washington, D.C.
- Cherubino Petti and Co., Inc., Atlantic City, N.J. \$1,080,000. 75,000 men's wool serge coats. Defense Personnel Support Center, Philadelphia.
- 5—Glenn Berry Mfg., Inc., Commerce, Okla. \$1,172,252. 1,140,000 pairs of men's cotton sateen trousers. Commerce and Oswego, Kan. Defense Personnel Support Center, Philadelphia.
- 6—The following contracts were awarded for JP-5 jet fuel by the Defense Fuel Supply Center, Washington, D.C.: Socony Mobil Oil Co., New York City. \$6,636,314. 73,222,000 gals.; Humble Oil & Refining Co., Houston, Tex. \$6,503,400. 77,000,000 gals.; Union Oil Company of California, Los Angeles. \$2,180,965. 21,403,000 gals.; Cities Service Oil Co., New York City. \$2,142,831. 25,200,000 gals.; Coastal States Petrochemical Co., Houston, Tex. \$1,790,407. 21,000,000 gals.
- Tennessee Overall Co., Tullahoma, Tenn. \$1,095,000. 500,000 pairs of men's polyester and wool tropical trousers. Tullahoma. Defense Personnel Support Center, Philadelphia.
- West Point-Pepperell, Inc., New York City. \$1,986,971. Nylon cloth. Shawmut, Ala. Defense Personnel Support Center, Philadelphia.
- 10—Northwestern Steel & Wire Co., Sterling, Ill. \$1,508,738. 155,540 coils of concertina barbed wire. Defense Construction Supply Center, Columbus, Ohio.
- 12—Electro Plastic Fabrics, Inc., Pulaski, Va. \$1,407,480. 222,000 ponchos. Defense Personnel Support Center, Philadelphia.
- Kenneth M. Wilson Co., Centerville, Tenn. \$1,482,978. 249,240 ponchos. Defense Personnel Support Center, Philadelphia.
- 16—Dovling Bag Co., Valdosta, Ga. \$1,099,400. 4,550,000 sand bags. Valdosta and Savannah, Ga. Defense General Supply Center, Richmond, Va.
- 24—Putnam Mills Corp., New York City. \$1,417,500. 3,500,000 yds. nylon parachute cloth. Vinton, Va.; Bristol, Tenn. and Putnam, Conn. Defense Personnel Support Center, Philadelphia.
- 25—Choctaw Mfg. Co., Silas, Ala. \$1,410,185. 706,860 pairs of white trousers. Defense Personnel Support Center, Philadelphia.
- 26—The following contracts were awarded for JP-4 fuel by the Defense Fuel Supply Center, Washington, D.C.: Debco Corp., Abilene, Tex. \$4,587,309. 50,255,000 gals.; Shamrock Oil & Gas Corp., Amarillo, Tex. \$4,022,860. 41,334,000 gals.; Golden Eagle Refining Co., Los Angeles. \$3,843,152. 40,094,344 gals.; Bell Oil & Gas Co., Tulsa, Okla. \$2,813,445. 34,650,000 gals.; Delta Refining Co., Memphis, Tenn. \$2,245,528. 23,230,000 gals.; MacMillan Ring-Free Oil Co., Los Angeles. \$2,194,912. 22,556,656 gals.; Sioux Oil Co., Newcastle, Wyo. \$2,062,725. 17,500,000 gals.; Howell Refining Co., San Antonio, Tex. \$1,683,754. 18,238,000 gals.; Northwestern Refining Co., St. Paul Park, Minn. \$1,505,506. 15,980,000 gals.; Crystal Flash Petroleum Corp., Indianapolis, Ind. \$1,198,582. 11,485,000 gals.; Tesoro Petroleum Corp., San Antonio, Tex. \$1,176,090. 11,000,000 gals.
- 27—Northwestern Steel & Wire Co., Sterling, Ill. \$1,464,700. 151,000 coils of concertina barbed wire. Defense Construction Supply Center, Columbus, Ohio.
- Lane Myers Co. Protection, Kan. \$1,364,675. 161,500 coils of concertina barbed wire. Defense Construction Supply Center, Columbus, Ohio.
- 30—The following contracts were awarded for JP-4 fuel by the Defense Fuel Supply Center, Washington, D.C.: Humble Oil & Refining Co., Houston, Tex. \$13,259,621. 158,147,000 gals.; Standard Oil Co. of Calif., San Francisco. \$11,586,074. 118,024,600 gals.; Continental Oil Co., Houston, Tex. \$11,284,194. 131,228,800 gals.; Sunray Oil Co., Tulsa, Okla. \$8,361,339. 92,870,000 gals.; Union Oil Co. of Calif., Los Angeles. \$8,176,591. 85,627,856 gals.; Socony Mobil Oil Co., New York City. \$6,678,238. 70,055,000 gals.; Texaco, New York City. \$6,206,759. 75,600,000 gals.; Cities Service Oil Co., New York City. \$5,530,614. 67,000,000 gals.; Sinclair Refining Co., New York City. \$5,319,100. 62,779,824 gals.; Tidewater Oil Co., Los Angeles. \$3,648,960. 37,800,000 gals.; Ashland Oil & Refining Co., Ashland, Ky. \$3,602,881. 37,126,225 gals.; Phillips Petroleum Co., Bartlesville, Okla. \$3,149,544. 36,173,000 gals.; Douglas Oil Co. of Calif., Los Angeles. \$3,053,600. 32,000,000 gals.; Suntime Refining Co., Tulsa, Okla. \$2,769,926. 34,000,000 gals.; American Petrofina Co. of Tex., Dallas, Tex. \$2,632,980. 29,000,000 gals.; American Oil Co., Chicago. \$2,266,021. 23,630,000 gals.; Shell Oil Co., New York City. \$1,629,360. 16,800,000 gals.; Triangle Refineries, Houston, Tex. \$1,462,400. 16,000,000 gals.; Great Northern Oil Co., Minneapolis, Minn. \$1,443,855. 15,000,000 gals.; Chevron Oil Co., El Paso, Tex. \$1,254,080. 13,200,000 gals.; Standard Oil Co., Cleveland, Ohio. \$1,215,600. 12,000,000 gals.; Hunt Oil Co., Dallas, Tex. \$1,080,000. 12,500,000 gals.; Sun Oil Co., Philadelphia. \$1,012,536. 10,080,000

- gals.; Kerr-McGee Oil Industries, Oklahoma City. \$1,006,800. 12,000,000 gals.
- Sportswelt Shoe Co., Nashua, N.H. \$2,252,696. 350,000 pairs of black combat boots. Newport, N.H. Defense Personnel Support Center, Philadelphia.
 - Safety First Shoe Co., Nashville, Tenn. \$1,663,985. 256,116 pairs of black combat boots. Huntsville, Ala. Defense Personnel Support Center, Philadelphia.

ARMY

- 2—Brezina Construction Co., Inc., Rapid City, S.D. \$2,213,284. Construction and excavation work at the Bowman-Haley Reservoir Project. Bowman, N.D. Engineer District, Omaha, Neb.
- 3—Remington Arms Co., Inc., Bridgeport, Conn. \$1,553,123. Small arms ammunition. Independence, Mo. Ammunition Procurement and Supply Agency (AMC), Joliet, Ill.
- Weatherhead Co., Cleveland, Ohio. \$2,945,372. Antitank projectiles. Cleveland. Ammunition Procurement and Supply Agency (AMC), Joliet, Ill.
- 4—Western Electric Co., New York City. \$9,975,000. Modification kits for HERCULES missiles. Burlington, N.C. Army Missile Command (AMC), Redstone Arsenal, Huntsville, Ala.
- A. O. Smith Corp., Chicago. \$2,705,000. 750-pound bomb parts. Houston, Tex. Ammunition Procurement & Supply Agency (AMC), Joliet, Ill.
- Southwest Truck & Body Co., Inc., St. Louis. \$1,744,326. Semi-trailer shop vans. West Plains, Mo. Army Tank Automotive Center (AMC), Warren, Mich.
- 5—Remington Arms Co., Inc., Bridgeport, Conn. \$13,827,878. 30 caliber ammunition. Independence, Mo. Army Tank Automotive Center (AMC), Warren, Mich.
- 6—Holston Defense Corp., Rochester, N.Y. \$5,942,288. Miscellaneous propellants and explosives. Kingsport, Tenn. Ammunition Procurement & Supply Agency (AMC), Joliet, Ill.
- General Electric Co., Burlington, Vt. \$2,434,923. 7.62mm aircraft machine guns and pods. Production tooling and repair parts. Burlington. Army Weapons Command (AMC), Rock Island, Ill.
- Schiller-Pfeiffer Machine Works, Inc., Southampton, Pa. \$2,990,000. Metal parts assemblies for 152mm cartridges. Picatinny Arsenal (AMC), Dover, N.J.
- Honeywell, Inc., Hopkins, Minn. \$1,191,799. Ordnance items. New Brighton, Minn. Ammunition Procurement and Supply Agency (AMC), Joliet, Ill.
- AVCO Corp., Richmond, Ind. \$1,179,193. Ordnance items. Richmond. Ammunition Procurement and Supply Agency (AMC), Joliet, Ill.
- 9—Hercules Powder Co., Wilmington, Del. \$2,443,844. Miscellaneous explosives and loading of missile motors. Radford, Va. Army Tank Automotive Center (AMC), Warren, Mich.
- Ling-Temco-Vought, Warren, Mich. \$1,947,000. LANCE missile items. Warren. Army Missile Plant, Warren, Mich.
- Remington Arms Co., Bridgeport, Conn. \$6,804,210. 30 caliber ammunition. Independence, Mo. Ammunition Procurement & Supply Agency (AMC), Joliet, Ill.
- 10—General Electric Co., Syracuse, N.Y. \$1,082,254. 13 trailer-mounted electric power plants. Syracuse. Engineer Research & Development Laboratories, Fort Belvoir, Va.
- Markwell & Hartz, Inc., Memphis, Tenn. \$1,653,925. Construction work on Pine Creek Reservoir, Little River Project. McCurtain County, Okla. Engineer District, Tulsa, Okla.
- Ryan Inc. of Wisconsin, Janesville, Wis. \$1,597,409. Construction work on Pike Island Lock and Dam, Ohio River Project. Near Wheeling, W. Va. Engineer District, Pittsburgh, Pa.
- Amron Corp., Waukesha, Wis. \$1,463,851. 20mm cartridge component. Frankford Arsenal (AMC), Philadelphia.
- 11—Raytheon Co., Lexington, Mass. \$5,168,000. Maintenance of guided and control sections for Hawk Missile Systems. Bedford, Mass. Army Missile Command (AMC), Huntsville, Ala.
- Erickson Paving Co., Bellvue, Wash. \$1,412,941. Construction work on Foster Reservoir, South Santiam River Project. Linn County, Ore. Engineer District, Portland, Ore.
- 12—Clement Bros. Co., Hickory, N.C. \$5,335,718. Construction on the Green River Dam and Reservoir. Campbellsville, Ky. Engineer District, Louisville, Ky.
- Boeing Company, Morton, Pa. \$13,948,723. \$1,229,840 and \$2,815,860. Repair parts for support of CH-47 Chinook Helicopters. Aviation Command (AMC), St. Louis.
- Goodyear Tire & Rubber Co., Akron, Ohio. \$1,327,892. M113 vehicle parts. St. Mary's, Ohio. Army Tank Automotive Center (AMC), Warren, Mich.
- Union Carbide Corp., New York City. \$1,639,603. Batteries for tactical radio sets. Chemway, N.C. Army Electronics Command, Philadelphia.
- 13—Teletype Corp., Skokie, Ill. \$1,500,000. Electronics Equipment. Electronics Command (AMC), Fort Monmouth, N.J.
- Boeing Co., Morton, Pa. \$3,991,058 and \$1,342,113. Repair parts for CH-47 Chinook Helicopters. Army Aviation Command (AMC), St. Louis.

- RCA, Camden, N.J. \$4,909,515. Radio equipment. Army Electronics Command (AMC), Philadelphia.
- Model Engineering & Manufacturing Corp., Huntington, Ind. \$6,837,321. Radio equipment. Huntington and/or Salt Lake City, Utah. Army Electronics Command (AMC), Philadelphia.
- Chandler Evans, Inc., West Hartford, Conn. \$1,801,597. Turbine fuel controls and governor assemblies for UH-1 helicopters. Aviation Materiel Command (AMC), St. Louis.
- McCarthy Bros. Construction Co., St. Louis. \$2,119,940. Construction on the Mississippi River at St. Louis. Engineer District, St. Louis.
- 16—Ryan Aeronautical Co., San Diego, Calif. \$1,090,000. Design and development of 500 lb. precision drop glider systems. San Diego and Yuma, Ariz. Army Aviation Laboratories, Fort Eustis, Va.
- 18—Philco Corp., Newport Beach, Calif. \$1,224,800. Industrial engineering services for the SHILLELAGH missile. Newport Beach, Los Angeles Procurement District (AMC), Pasadena, Calif.
- Stewart Warner Corp., Indianapolis, Ind. \$1,331,894. Bomb parts. Indianapolis. Ammunition Procurement and Supply Agency (AMC), Joliet, Ill.
- 19—Boeing Co., Seattle, Wash. \$2,000,000. Research and development services on HIBEX program. Seattle. San Francisco Procurement Div. (AMC), Oakland, Calif.
- Fruehauf Corp., Detroit. \$1,284,674. XM674 semi-trailers. Delphos, Ohio. Army Tank Automotive Center (AMC), Warren, Mich.
- Hercules Powder Co., Wilmington, Del. \$1,000,000. Maintenance and support services. Sunflower Army Ammunition Plant, Lawrence, Kan. Ammunition Procurement & Supply Agency (AMC), Joliet, Ill.
- 20—White Motor Co., Lansing, Mich. \$4,202,563. 2½ ton trucks. Army Mobility Command (AMC), Warren, Mich.
- Case Master Body, Inc., Rose City, Mich. \$3,199,911. 400-gallon water tank trailers. Rose City. Army Tank Automotive Center (AMC), Warren, Mich.
- 23—Chrysler Motors, Detroit. \$3,078,815. One-ton cargo trucks (M601). Warren, Mich. Army Mobility Command (AMC), Warren, Mich.
- Raytheon Co., Lexington, Mass. \$1,250,000. Selected items of ground support equipment for the HAWK missile system. Waltham and Andover, Mass. Army Missile Command (AMC), Huntsville, Ala.
- Associated Builders, Inc., Cleveland, Ohio. \$1,048,500. Roofing and insulation work at the Cleveland Tank Plant. Engineer District, Louisville, Ky.
- General Motors, Detroit. \$2,242,000. Engine development for the U.S./Federal Republic of Germany main battle tank. Detroit and Warren, Mich. Army Tank Automotive Center (AMC), Warren, Mich.
- Fegles Construction Co., Minneapolis. \$2,000,000. Construction of facilities to dispose of waste red water from explosive production operations. Joliet, Ill. Engineer District, Chicago.
- AVCO Corp., Richmond, Ind. \$1,550,628. Adapter boosters and metal parts (M126A1). Ammunition Procurement and Supply Agency (AMC), Joliet, Ill.
- 25—Colt's Inc., Hartford, Conn. \$4,182,304. M-16 rifles for the Air Force and Coast Guard. Army Weapons Command (AMC), Rock Island, Ill.
- Number One Contracting Corporation of Delaware, West Pittston, Pa. \$2,062,326. Work on Blanchard Reservoir Project. Near Lock Haven, Pa. Engineer District, Baltimore.
- 26—Bowen-McLaughlin-York, Inc., York, Pa. \$11,983,784. Eight-inch howitzers (M110) and recovery vehicles. York. Army Tank Automotive Center (AMC), Warren, Mich.
- Bristol Electronics, New Bedford, Mass. \$4,321,810. Radio sets and receiver-transmitters. New Bedford. Army Electronics Command (AMC), Philadelphia.
- Sperry Rand Corp., New York City. \$5,448,941. Ammunition. Shreveport, La. Ammunition and Procurement Agency (AMC), Joliet, Ill.
- 27—Peter Kiewit Sons, Richmond, Calif. \$1,798,150. Work on Half Moon Bay project, San Francisco. Engineer District, San Francisco.
- A. S. Schulman Electric Co., Los Angeles. \$1,108,931. Work on Green Peter Reservoir Project. Near Foster, Ore. Engineer District, Portland, Ore.
- Newport News Shipbuilding and Drydock Co., Newport News, Va. \$1,631,780. Work on Carters Dam on the Coosawattee River, Georgia, Project. Engineer District, Mobile, Ala.
- Grumman Aircraft Engineering Corp., Bethpage, N.Y. \$1,400,000. Modernization of OV-1C MOHAWK aircraft. Stuart, Fla. and Bethpage. Army Aviation Command (AMC), St. Louis, Mo.
- California Electric Mfg. & Service Co., Wilmington, Calif. \$1,328,490. ¼-ton cargo trailers. Army Tank Automotive Center (AMC), Warren, Mich.
- Highway Products, Inc., Kent, Ohio. \$1,448,960. HAWK guided missile launchers. Army Missile Command (AMC), Redstone Arsenal, Huntsville, Ala.
- Kanarr Corp., Kingston, Pa. \$1,221,116. M-79 grenade launchers. Army Weapons Command (AMC), Rock Island, Ill.
- Goodyear Tire & Rubber Co., Akron, Ohio. \$1,633,200. 10,000-gallon collapsible tank assemblies. Rockmart, Ga. Army Mobility Equipment Center (AMC), St. Louis.
- Collins Radio Co., Richardson, Tex. \$2,295,000. Radio terminal sets. Army Electronics Command (AMC), Philadelphia.
- 30—Dynalectron Corp., Washington, D.C. \$4,542,538. Installation, operation and maintenance of government owned data collection facilities at the White Sands Missile Range. Missile Range Headquarters, White Sands, N.M.
- Hol Gar Mfg. Co., Primos, Pa. \$1,194,720 and \$1,052,142. 3,055 generator sets (1½ KW, 60 cycle) and 2,573 generator sets (1½ KW, 28 volts). Army Mobility Command (AMC), St. Louis.
- Packard Bell Electronics Corp., Newbury Park, Calif. \$1,551,416. Transponder test sets. Procurement District (AMC), Los Angeles.
- Pathman Construction Co., Chicago. \$4,030,500. Construction of 250 family housing units at Fort Sheridan, Ill. Engineer District, Chicago.
- Bristol Electronics Corp., New Bedford, Mass. \$1,095,949. Radio amplifiers. Army Electronics Command (AMC), Philadelphia.
- Chromcraft Corp., St. Louis. \$1,203,058. 2.75 airborne rocket launchers. Ammunition Procurement & Supply Center (AMC), Joliet, Ill.
- 31—U.S. Rubber Co., New York City. \$5,900,834. Reactivation and maintenance activities at the Army Ammunition Plant, Joliet, Ill. Ammunition Procurement & Supply Agency (AMC), Joliet, Ill.
- Magnavox Co., Fort Wayne, Ind. \$1,119,366. Radio receivers and receiver-transmitters. Urbana, Ill. and Fort Wayne. Army Electronics Command (AMC), Philadelphia.
- Thompson-Ramo-Woodbridge, Cleveland, Ohio. \$2,282,458. Grenade launchers. Rock Island Arsenal (AMC), Rock Island, Ill.
- Olin Mathieson Chemical Corp., Lexington, Ky. \$4,574,574. 155mm ammunition and operation and maintenance activities. Army Ammunition Plant, Charlestown, Ind. Ammunition Procurement and Supply Agency (AMC), Joliet, Ill.
- Dynamics Corp. of America, Bridgeport, Conn. \$2,841,450. 10 KW, 60-cycle generator sets. Army Mobility Equipment Center (AMC), St. Louis.
- Green Construction Co. of Indiana, Oaktown, Ind. \$1,188,686. Work on Wabash River Basin Project, Princeton, Ind. Engineer District, Louisville, Ky.
- Sperry-Phoenix Co., Phoenix, Ariz. \$2,020,002. Electronic Control amplifiers and radio indicators. Los Angeles Procurement District (AMC), Pasadena, Calif.
- Honeywell, Inc., Hopkins, Minn. \$2,382,065. Ammunition components. New Brighton, Minn. Ammunition Procurement and Supply Agency (AMC), Joliet, Ill.
- Institute for Defense Analyses, Arlington, Va. \$1,590,000. Evaluation and operational analyses by issuance of task orders. Defense Supply Service, Washington, D.C.
- Dynamics Corp. of America, Bridgeport, Conn. \$9,852,479. Generator sets. Army Mobility Equipment Center (AMC), St. Louis.
- Bell & Howell Co., Chicago. \$1,836,436. Ordnance items. Ammunition Procurement and Supply Agency (AMC), Joliet, Ill.

NAVY

- 2—Lockheed Missiles and Space Co., Sunnyvale, Calif. \$23,597,250. Engineering program associated with POLARIS A-3 missile. Sunnyvale. Special Projects Office.
- 3—United Aircraft Corp., East Hartford, Conn. \$1,281,089. Spare parts for J-52, J-57 and J-48 jet aircraft engines. East Hartford. Navy Aviation Supply Office, Philadelphia.
- Varian Associates, Palo Alto, Calif. \$1,532,425. Procurement and installation of a microwave linear accelerator at the National Naval Medical Center, Bethesda, Md. Bureau of Yards and Docks.
- General Electric, Washington, D.C. \$4,846,237. Modifications to the MK-84 fire control system. Pittsfield, Mass. Special Projects Office.
- American Mfg. Co., of Texas, Fort Worth, Tex. \$1,464,487. 5-inch caliber projectiles. Fort Worth. Navy Ships Parts Control Center, Mechanicsburg, Pa.
- 4—Lockheed Missiles & Space Co., Sunnyvale, Calif. \$9,000,000. Classified services in connection with POLARIS missile program. Sunnyvale. Special Projects Office.
- 5—Lockheed Missiles & Space Co., Sunnyvale, Calif. \$88,318,048. Manufacture of POLARIS A-3 missiles. Sacramento, Calif.; Barchus, Utah; and Sunnyvale. Special Projects Office.
- Cortelyou & Cole, Inc. and City Electric, Inc., Mountain View, Calif. \$1,027,000. Construction of an electrical distribution system and operation building extension. Skaggs Island, Calif. Director, Western Division, Bureau of Yards & Docks.
- United States Steel Corp., Pittsburgh. \$7,042,000. Bomb bodies. McKeesport, Pa. Navy Ships Parts Control Center, Mechanicsburg, Pa.
- American Machine & Foundry Corp., York, Pa. \$1,929,915. Mortars. York. Navy Ships Parts Control Center, Mechanicsburg, Pa.
- Verdel Construction Co., Baltimore, Md. \$1,258,150. Construction of WAVE barracks and conversion of boilers in bldg. #502. Naval Training Center, Bainbridge, Md. Director, Atlantic Division, Bureau of Yards & Docks.
- 6—E. C. Ernest, Inc., Norfolk, Va. \$2,296,863. Extension of pier utilities. Naval Station, Norfolk. Director, Atlantic Division, Bureau of Yards & Docks.
- Bell Aerospace Corp., Buffalo, N.Y. \$2,065,618. Navy managed portion of the tri-service VTOL aircraft program. Wheatfield, N.Y. Bureau of Naval Weapons.
- Aerojet General Corp., Azusa, Calif. \$3,389,939. MK 46 torpedoes. Bureau of Naval Weapons.
- 9—Interstate Electronics Corp., Anaheim, Calif. \$2,272,419. Instrumentation associated with POLARIS weapons system. Anaheim. Special Project Office.
- Boeing Co., Morton, Pa. \$11,871,164. Dynamic parts for CH-46A helicopters. Morton. Navy Aviation Supply Office, Philadelphia.
- American Machine & Foundry Corp., York, Pa. \$2,013,862. Liquid propellant rocket engines. Navy Purchasing Office, Washington, D.C.
- 11—Kaiser Aluminum Chemical Sales, Oakland, Calif. \$4,603,791. Aluminum airfield matting extrusions. Halethorpe, Md. Navy Aviation Supply Office, Philadelphia.
- Amron Corp., Waukesha, Wis. \$2,444,709. 20mm steel cartridge cases. Navy Ship's Parts Control Center, Mechanicsburg, Pa.
- Dow Metal Products, Midland, Mich. \$5,487,713. Aluminum airfield matting extrusions. Madison, Ill. Navy Aviation Supply Office, Philadelphia, Pa.
- Harvey Aluminum, Torrance, Calif. \$3,432,960. Airfield landing mat and pallet assemblies. Navy Aviation Supply Office, Philadelphia.
- Curtiss-Wright, Wood-Ridge, N.J. \$3,151,911. Spare parts for engines used in various aircraft. Navy Aviation Supply Office, Philadelphia.
- Emerson Electric, St. Louis. \$1,332,395. Indicator groups for use in T3A aircraft. Mt. Pleasant, Iowa and St. Louis. Navy Aviation Supply Office, Philadelphia.

- Aluminum Co. of America, Pittsburgh. \$2,986,560. Aluminum airfield matting extrusions. Lafayette, Ind. Navy Aviation Supply Office, Philadelphia.
- Sperry Rand Corp., Univac Div., St. Paul, Minn. \$1,899,856. Computers and associated equipment for installation aboard ships. Bureau of Ships.
- S. S. Mullen, Inc., Seattle, Wash. \$2,841,086. Erection of 260 USAHOMES (prefabricated homes) and site preparation for 90 USAHOMES. Naval Station, Kodiak, Alaska. Director, Northwest Div., Bureau of Yards and Docks.
- 12—Chromcraft Corp., St. Louis. \$5,191,711. MIGHTY MOUSE rocket launchers for the Air Force. St. Louis. Bureau of Naval Weapons.
- Litton Systems, Beverly Hills, Calif. \$15,326,863. Navigational systems for A6A and E2A aircraft. Woodland Hills, Calif. Navy Aviation Supply Office, Philadelphia.
- General Electric, Cincinnati. \$1,988,321. Spare part kits in support of jet engines for F4B aircraft. Navy Aviation Supply Office, Philadelphia.
- Sikorsky Aircraft, Stratford, Conn. \$1,901,484. Gear box assemblies for CH-3C helicopters. Navy Aviation Supply Office, Philadelphia.
- Curtiss-Wright, Wood-Ridge, N.J. \$1,003,327. Spare part kits for aircraft engines. Navy Aviation Supply Office, Philadelphia.
- 13—United Aircraft, East Hartford, Conn. \$23,067,200. TF-30 engines for the Air Force. Bureau of Naval Weapons.
- United Aircraft Corp., Norwalk, Conn. \$5,592,131. Spare parts for radar sets for A6A aircraft. Navy Aviation Supply Office, Philadelphia.
- Kaiser Air, Space & Electronics Corp., Palo Alto, Calif. \$1,000,000. Spare parts for the data display system used in the A6A aircraft. Navy Aviation Supply Office, Philadelphia.
- Sperry Rand Corp., St. Paul, Minn. \$2,710,240. Computer digital data sets, associated equipment and engineering services, for installation of Naval Tactical Data System equipment on naval ships and at shore stations. Bureau of Ships.
- McDonnell Aircraft Corp., St. Louis. \$1,000,000. Classified weapon system development and program definition studies. Bureau of Naval Weapons.
- 16—PRD Electronics, Inc., Westbury, L.I., N.Y. \$1,698,000. FY 1966 installment funding for R&D on VAST (versatile avionics shop test equipment) program. Bureau of Naval Weapons.
- Sanders Associates, Inc., Nashua, N.H. \$3,165,000. Classified electronics equipment. Bureau of Naval Weapons.
- 17—T.M.C. Systems Inc., Alexandria, Va. \$1,451,381. Air transportable communication units for Navy shore based radio stations. Alexandria. Navy Purchasing Office, Washington, D.C.
- AVCO Corp., Richmond, Ind. \$4,252,764. POLARIS arming and fuzing devices. Richmond. Special Project Office.
- 18—R. M. Wells Co., Quanah, Tex. \$1,977,285. Rehabilitation of Wherry Housing at Naval Training Center, Bainbridge, Md. Director, Atlantic Div., Bureau of Yards and Docks.
- 23—Sewart Searcraft, Berwick, La. \$4,841,218. Construction and delivery of SWIFT boats and spare engines. Berwick. Bureau of Ships.
- H. H. Robertson Co., Connerville, Ind. \$1,115,431. Prefabrication of personnel facility structures for Operation DEEP FREEZE. Bureau of Yards and Docks.
- General Motors, Indianapolis, Ind. \$4,033,421. Spare parts for aircraft engines for E-2A, C-130 and P3A aircraft. Indianapolis. Aviation Supply Office, Philadelphia.
- 24—Aerojet General Corp., Azusa, Calif. \$60,698,094. MK 46 torpedoes and related equipment. Bureau of Naval Weapons.
- 25—Goodyear Tire and Rubber Co., Akron, Ohio. \$1,379,468. Aircraft tires. Navy Aviation Supply Office, Philadelphia.
- Canadian Commercial Corp., Montreal, Quebec, Canada. \$1,408,620. Crankcase assemblies for aircraft engines. Navy Aviation Supply Office, Philadelphia.
- Litton Systems, Inc., Beverly Hills, Calif. \$2,000,000. Special support equipment for inertial navigation systems for P-3A aircraft. Woodland Hills, Calif. Navy Aviation Supply Office, Philadelphia.
- United Aircraft, E. Hartford, Conn. \$4,252,356. Jet aircraft engines. Navy Aviation Supply Office, Philadelphia.
- United Aircraft, E. Hartford, Conn. \$7,355,043. Miscellaneous spare parts for jet aircraft engines. Navy Aviation Supply Office, Philadelphia.
- United Aircraft, E. Hartford, Conn. \$1,820,769. Propeller assemblies for use on P-3A aircraft. Windsor Locks, Conn. Navy Aviation Supply Office, Philadelphia.
- Harvell-Kilgore Corp., Toone, Tenn. \$6,474,840. Parachute flares. Navy Ships Parts Control Center, Mechanicsburg, Pa.
- 26—United Aircraft, E. Hartford, Conn. \$3,257,240. TF-30 engines for the Air Force. Bureau of Naval Weapons.
- Lockheed Aircraft, Watchung, N.J. \$1,950,000. FY 66 funding for the MK 86 lightweight gun fire control system. Bureau of Naval Weapons.
- North American Aviation, Columbus, Ohio. \$2,000,000. Shipboard integrated operational intelligence center. Bureau of Naval Weapons.
- J. W. Bateson Construction Co., Dallas, Tex. \$4,679,000. Construction of 150 family housing units for Navy enlisted men and 150 family units for Air Force enlisted men at Bolling AFB, Washington, D.C. Director, Chesapeake Div. Bureau of Yards and Docks.
- Bethlehem Steel Corp., Baltimore, Md. \$1,687,738. Reactivation of the USNS General Nelson M. Walker (T-AP-125). Commander, Military Sea Transportation Service, Atlantic Area.
- Todd Shipyards, Los Angeles. \$1,733,728. Reactivation of the USNS General William Weigel (T-AP-119). San Pedro, Calif. Commander Military Sea Transportation Service, Pacific Area.
- Todd Shipyards, San Francisco. \$1,653,228. Reactivation of the USNS General John Pope (T-AP-110). Alameda, Calif. Commander, Military Sea Transportation Service, Pacific Area.
- 27—Westinghouse Electric, Pittsburgh, Pa. \$20,923,369. Research and development in nuclear propulsion plants for Navy ships. Pittsburgh. Bureau of Ships.
- General Electric, Schenectady, N.Y. \$10,476,000. Research and development in nuclear propulsion plants for Navy ships. Schenectady. Bureau of Ships.
- Kaman Aircraft, Bloomfield, Conn. \$2,771,916. Rotor blades for UH-2A/B helicopters. Navy Aviation Supply Office, Philadelphia.
- 30—United Aircraft, Windsor Locks, Conn. \$2,900,500. Repair parts for propellers for P-3A aircraft. Navy Aviation Supply Center, Philadelphia.
- General Electric, Pittsfield, Mass. \$1,145,003. Manufacture of POLARIS guidance test sets. Special Projects Office.
- General Precision, Inc., Glendale, Calif. \$1,300,000. Modifications to the fire control system for MK 48 torpedoes. Bureau of Naval Weapons.
- 31—Ryan Aeronautical Co., San Diego, Calif. \$2,550,000. Production of FIREBEE target drones. San Diego. Bureau of Naval Weapons.

AIR FORCE

- 2—Burttek, Inc., Tulsa, Okla. \$2,026,840. Instrument flight trainers. Tulsa. Aeronautical Systems Div. (AFSC), Wright-Patterson AFB, Ohio.
- Martin-Marietta, Baltimore. \$3,494,000. Design, development, fabrication and flight testing of a maneuverable re-entry vehicle (Project START). Baltimore. Space Systems Div. (AFSC), Los Angeles.
- 3—M.I.T., Cambridge, Mass. \$24,793,000. Research and development of advanced electronic programs including space communications. Lexington, Mass. Electronics Systems Div. (AFSC), L. G. Hanscom Field, Mass.
- Sylvania Electric Products, Mountain View, Calif. \$3,251,701. Spare parts for electronic data processing equipment. Mountain View. Warner-Robins Air Materiel Area (AFSC), Robins AFB, Ga.
- General Motors, Milwaukee, Wis. \$2,500,000. Work on an inertial guidance system. Milwaukee. Space Systems Div. (AFSC), Los Angeles.
- Federal Pacific Electric, Newark, N.J. \$1,796,000. Fabrication of electrical switching gear. Newark. Ballistic Systems Div. (AFSC), Norton AFB, Calif.
- Lear Siegler, Inc., Grand Rapids, Mich. \$1,350,606. Procurement of aircraft gyroscope assemblies and power amplifiers. Aeronautical Systems Div. (AFSC), Wright-Patterson AFB, Ohio.
- 4—Thompson Ramo Woolridge Inc., Redondo Beach, Calif. \$10,800,000 and \$8,396,830. FY 66 MINUTEMAN development support services and non-development support services. Norton AFB, Calif. Ballistic Systems Div. (AFSC), Los Angeles.
- Boeing Co., Seattle, Wash. \$4,462,000. Development, test and engineering for modernization of Wings I through V of the MINUTEMAN weapon system. Seattle. Ballistic Systems Div. (AFSC), Los Angeles.
- Dow Chemical Co., Midland, Mich. \$1,137,091. Production of ordnance. Torrance, Calif. Aeronautical Systems Div. (AFSC), Wright-Patterson AFB, Calif.
- Lear Siegler, Inc., Santa Monica, Calif. \$1,291,540. Scientific study in support of missile range safety. Santa Monica. Air Force Western Test Range (AFSC), Vandenberg AFB, Calif.
- Thompson Ramo Woolridge, Inc., Redondo Beach, Calif. \$2,000,000. Work on space-ground communications. Redondo Beach. Space Systems Div. (AFSC), Los Angeles.
- General Electric, Arkansas City, Kan. \$2,359,360. Overhaul and modification of J-85 engines. Arkansas City. Oklahoma City Air Materiel Area (AFSC), Tinker AFB, Okla.
- Colt Industries, Pratt & Whitney, Inc., Cudahy, Calif. \$3,510,942. Production of machine tools. Cudahy. Aeronautical Systems Div. (AFSC), Wright-Patterson AFB, Ohio.
- New Britain Machine Co., Cleveland. \$1,081,868. Production of machine tools. Cleveland. Aeronautical Systems Div. (AFSC), Wright-Patterson AFB, Ohio.
- Giddings & Lewis Machine Tool Co., Fond du Lac, Wis. \$2,109,275. Production of machine tools. Aeronautical Systems Div. (AFSC), Wright-Patterson AFB, Ohio.
- Kearney & Trecker Corp., Milwaukee, Wis. \$2,324,000. Production of machine tools. Milwaukee. Aeronautical Systems Div. (AFSC), Wright-Patterson AFB, Ohio.
- 5—Lockheed Aircraft, Ontario, Calif. \$2,160,826. Modification of C-133 aircraft. Ontario. Warner-Robins Air Materiel Area (AFSC), Robins AFB, Ga.
- Stearns-Roger Corp., Denver. \$1,098,414. Rocket engine propellants. West Palm Beach, Fla. Middletown Air Materiel Area (AFSC), Olmsted AFB, Pa.
- 6—Lockheed Aircraft Service Co., Jamaica, N.Y. \$1,702,000. Overhaul and routine maintenance of the special air mission (SAM) fleet. Oklahoma City Air Materiel Area (AFSC), Tinker AFB, Okla.
- 9—Aerojet-General Corp., Sacramento, Calif. \$3,593,000. TITAN II propulsion systems. Sacramento. San Bernardino Air Materiel Area (AFSC), Norton AFB, Calif.
- Hazeltine Corp., Little Neck, N.Y. \$1,825,000. Production of communications equipment. Little Neck. Aeronautical Systems Div. (AFSC), Wright-Patterson AFB, Ohio.
- 10—Univac, Sperry Rand Corp., Washington, D.C. \$6,705,610. Electronic data processing systems. Philadelphia. 2750th Air Base Wing (AFSC), Wright-Patterson AFB, Ohio.
- Lockheed Aircraft, Burbank, Calif. \$1,437,600. Maintenance of instrumentation and equipment for collection of high altitude clear air turbulence data. Systems Engineering Group (AFSC), Wright-Patterson AFB, Ohio.
- Hughes Aircraft, Culver City, Calif. \$6,150,000. Modification of MINUTEMAN missile test equipment. Culver City. Middletown Air Materiel Area (AFSC), Olmsted AFB, Pa.
- Hughes Aircraft, Culver City, Calif. \$4,800,000. Flight test program for the F-4E aircraft. Culver City. Aeronautical Systems Div. (AFSC), Wright-Patterson AFB, Ohio.
- Boeing Co., Morton, Pa. \$22,000,000. Production of CH-47A helicopters and related ground equipment. Morton. Aeronautical Systems Div. (AFSC), Wright-Patterson AFB, Ohio.
- 11—Avco Corp., Stratford, Conn. \$3,000,000. Production of T-55 series aircraft engines. Stratford. Aeronautical Systems Div. (AFSC), Wright-Patterson AFB, Ohio.
- 12—Boeing Co., Wichita, Kan. \$4,900,468. FY 66 B-52 Fleet Support Program. Oklahoma City Air Materiel Area (AFSC), Tinker AFB, Okla.

- 13—M.I.T., Cambridge, Mass. \$1,260,000. Procurement of a development model—stabilized navigation system. Aeronautical Systems Div. (AFSC), Wright-Patterson AFB, Ohio.
- Philco Corp., Fort Washington, Pa. \$1,020,387. Operation of the precision measurements equipment laboratory at Vandenberg AFB, Calif. Air Force Western Test Range (AFSC), Vandenberg AFB, Calif.
- 16—Textron, Inc., Grants Pass, Ore. \$2,066,096. Ejector racks for F-4C aircraft. Grants Pass. Warner-Robins Air Materiel Area (AFLC), Robins AFB, Ga.
- 17—Kearney & Trecker Corp., Milwaukee, Wis. \$1,923,783. Production of machine tools and related equipment. Milwaukee. Aeronautical Systems Div. (AFSC), Wright-Patterson AFB, Ohio.
- Sundstrand Corp., Belvidere, Ill. \$1,982,079. Production of machine tools and related equipment. Belvidere. Aeronautical Systems Div. (AFSC), Wright-Patterson AFB, Ohio.
- 18—Aerodex, Inc., Miami, Fla. \$3,390,468. Overhaul of R-4360 engines. Sacramento Air Materiel Area, McClellan AFB, Calif.
- General Electric, Philadelphia. \$1,494,000. Flight testing of the Maneuvering Ballistic Re-entry Vehicle. Philadelphia. Ballistic Systems Div. (AFSC), Norton AFB, Calif.
- Convair, San Diego, Calif. \$1,000,000. Production of ATLAS/AGENA boosters. San Diego. Space Systems Div. (AFSC), Los Angeles.
- 19—General Electric, Cincinnati. \$88,273,000. Procurement of J79-GE-15 turbojet engines for F-4 and RF-4 aircraft. Aeronautical Systems Div. (AFSC), Wright-Patterson AFB, Ohio.
- General Electric, Cincinnati. \$2,034,600. Modification kits and spare parts for J-79 engines. Oklahoma City Air Materiel Area (AFLC), Tinker AFB, Okla.
- 20—Hughes Aircraft Co., Culver City, Calif. \$2,603,500. Engineering services for test and evaluation of the F-102 and F-106 aircraft. Holloman AFB, N. M. San Antonio Air Materiel Area (AFLC), Kelly AFB, Tex.
- Martin-Marietta, Baltimore, Md. \$1,650,730. Modification of B-57 aircraft. Middle River, Md. Warner-Robins Air Materiel Area (AFLC), Robins AFB, Ga.
- B. F. Goodrich, Akron, Ohio. \$1,026,112. Production of B-52 aircraft tires. Akron. Ogden Air Materiel Area (AFLC), Hill AFB, Utah.
- 23—United Aircraft, Windsor Locks, Conn. \$3,445,237. Modification of B-52 engine starters and related equipment. Windsor Locks. Oklahoma City Air Materiel Area (AFLC), Tinker AFB, Okla.
- 24—Cardion Electronics, Westbury, N. Y. \$1,178,350. Procurement of radar sets. Electronic Systems Div. (AFSC), L. G. Hanscom Field, Mass.
- General Electric, West Lynn, Mass. \$4,324,868. Procurement of T-58 engines. Aeronautical Systems Div. (AFSC), Wright-Patterson AFB, Ohio.
- Southwest Airmotive Co., Dallas, Tex. \$1,130,091. Overhaul of J-47 engines and components. Dallas. Oklahoma City Air Materiel Area (AFLC), Tinker AFB, Okla.
- Hayes International Corp., Birmingham, Ala. \$1,700,000. Procurement of aircraft fuel tanks. Aeronautical Systems Div. (AFLC), Wright-Patterson AFB, Ohio.
- North American Aviation, Los Angeles. \$1,000,000. Technical services and parts (repair and replacement), in support of the X-15 research aircraft program. Los Angeles. Aeronautical Systems Div. (AFLC), Wright-Patterson AFB, Ohio.
- 25—Boeing Co., Seattle, Wash. \$9,041,144. Fabrication, assembly check-out and test of MINUTEMAN equipment. Seattle. Ballistic Systems Div. (AFSC), Norton AFB, Calif.
- General Motors, Milwaukee, Wis. \$1,433,900. Work on TITAN II missile guidance system. Oak Creek, Wis. Middletown Air Materiel Area (AFLC), Olmsted AFB, Pa.
- 26—Hughes Aircraft, Culver City, Calif. \$22,952,523. Modification of FALCON missiles. Tucson, Ariz. Middletown Air Materiel Area (AFLC), Olmsted AFB, Pa.
- American Bosch Arma Corp., Garden City, N. Y. \$1,241,000. Work on advanced ballistic re-entry system program. Garden City. Ballistic Systems Div. (AFSC), Norton AFB, Calif.
- Westinghouse Electric, Baltimore, Md. \$5,945,707. Production of low frequency communications sets. Baltimore. Electronic Systems Div. (AFSC), L. G. Hanscom Field, Mass.
- 27—North American Aviation, Columbus, Ohio. \$2,520,506. Modification of T-28 aircraft. Columbus. Sacramento Air Materiel Area (AFLC), McClellan AFB, Calif.
- Bendix Corp., South Bend, Ind. \$1,101,000. F-101 landing gear assemblies. Ogden Air Materiel Area (AFLC), Hill AFB, Utah.
- 30—Magnavox Co., Fort Wayne, Ind. \$1,227,000. Procurement of communications equipment for C-141 aircraft. Warner-Robins Air Materiel Area (AFLC), Robins AFB, Ga.
- Dallas Airmotive, Inc., Dallas, Tex. \$2,099,458. Overhaul of R-2800 engines. San Antonio Air Materiel Area (AFLC), Kelly AFB, Tex.
- North American Aviation, Los Angeles. \$1,750,000. Test work on the F-100 aircraft. Sacramento Air Materiel Area (AFLC), McClellan AFB, Calif.
- General Electric, West Lynn, Mass. \$3,300,000. Production of J-85 engines. West Lynn. Aeronautical Systems Div. (AFSC), Wright-Patterson AFB, Ohio.
- International Telephone & Telegraph Corp., Paramus, N. J. \$1,164,500. Engineering services and material in support of the Strategic Air Command Control System. Paramus and Offutt AFB, Neb. Electronic Systems Div. (AFSC), L. G. Hanscom Field, Mass.
- 31—Standard Mfg. Co., Dallas, Tex. \$2,142,000. Production of munitions handling trucks. Dallas. San Antonio Air Materiel Area (AFLC), Kelly AFB, Tex.
- I.B.M., Rockville, Md. \$2,290,076. Engineering research to develop improved computer programming techniques. Omaha, Neb. and Washington, D. C. Rome Air Development Center (AFSC), Griffiss AFB, N. Y.

Industrial Security Management Courses Offered To Contractor REPS

Industrial Security Management Courses for contractor representatives will be given in October at the Boston and Dallas Defense Contract Administration Services (DCAS) Regions. A requirement for enrollment is a current security clearance of Confidential or higher.

The courses are presented by the instructor staff from the U. S. Army Intelligence School, Fort Holabird, Baltimore, Md., and are periodically scheduled at various locations in the United States as a service to contractors. These courses are field extensions of the resident courses presented at Fort Holabird.

The course in Boston will be presented October 18-22 at the Hotel Madison, North Station, Boston, Mass. To enroll or request more information, contact the Chief, Office of Industrial Security, DCAS Region, Boston, 666 Summer Street, Boston, Mass. 02210, telephone: (Area Code 617) LIberty 2-6000, Ext. 809.

The course in Dallas will be presented October 25-29 at the Ramada Inn, 6900 Cedar Springs Road, Dallas, Tex., located near the entrance to Love Field. To enroll or request more information, contact the Chief, Office of Industrial Security, DCAS Region, Dallas, 500 S. Ervay Street, Dallas, Tex. 75201, telephone: (Area Code 214) RIverside 9-2039 or RIverside 9-3589.

Atlantic-Pacific Interoceanic Canal Study Commission Appointed

A study of the engineering feasibility of various routes and methods of construction of a sea-level canal connecting the Atlantic and Pacific Oceans is being planned by a special five-man commission appointed by the President.

The group, called the Atlantic-Pacific Interoceanic Canal Study Commission, has requested that the Secretary of the Army appoint the Chief of Engineers, Army Corps of Engineers, as its agent for conducting the study.

The Army Engineers will develop, in coordination with the AEC, the Panama Canal Company, and other agencies, a plan for collecting and evaluating the necessary geologic, hydrologic and other scientific data in Panama and other countries. This information will be used by the Commission to determine the most feasible location for the canal, the best method of construction and the cost of the project.

After review and approval of the plan by the Commission, the Chief of Engineers will supervise the execution of the plan.

Members of the Commission are former Secretary of the Treasury Robert B. Anderson as Chairman, Dean Robert Storey as Vice Chairman, Dr. Milton Eisenhower, Mr. Raymond Hill and Mr. Kenneth Fields, former General Manager of AEC.



Hawaii Gov. Burns Calls Conference on Oceanography and Astronautics

Governor John A. Burns of Hawaii has called a Conference on Oceanography and Astronautics to be held Sept. 29 to Oct. 2 at the Kauai Surf Hotel.

Purpose of the conference will be to evaluate the nation's oceanographic and space programs within the context of recent developments in these fields, including the selection of Hawaii as the primary site for the Mohole Project.

Governor Burns said the meeting is an extension of the Conference on Science and Technology held last January in Maui. The forthcoming conference will be more concentrated and specialized with executives, scientists and technicians in the fields of oceanics and space attending. Vice Admiral John T. Hayward, Commander, Anti-Submarine Warfare Force, Pacific, is conference chairman.

Among those invited to address the conference are Jacques Cousteau, internationally famous undersea explorer; Dr. William Pickering of California Institute of Technology's Jet Propulsion Lab; General Bernard A. Schriever, Commander, Air Force Systems Command; Dr. Gordon Lill, Director of Project Mohole for the National Science Foundation; Dr. Hugh Dryden, Deputy Administrator and chief scientist of NASA; and Dr. James H. Wakelin, president of the Scientific Engineering Institute and former Assistant Secretary of the Navy for Research and Development. Dr. Wakelin was the former chairman of the Interagency Committee on Oceanography.

The conference is being held on the island of Kauai to give some 300 conferees an opportunity to inspect the multi-million dollar underwater electronic test range installation and supporting facilities for anti-submarine warfare research under construction off the island. These facilities will become part of the Pacific Missile Range complex at Barking Sands, Kauai, and will be near the Kokee Park Station, a key facility for America's manned space flights.

Plans call for a program of two and a half days with afternoon tours of the test range site and aero-space facilities on the island and formal addresses in the mornings. Six papers will be presented in the field of oceanics on Sept. 30, and six more in the fields of astrophysics and space on Oct. 1. The conference will close Oct. 2, with a summary panel session under the chairmanship of Admiral Hayward.

Registration for the conference will be conducted Sept. 29.

Construction Begins on Nuclear Reactor Facility

Senator Joseph D. Tydings (D.-Md.) and Representative Clarence D. Long (D.-Hartford County, Md.) were the principal speakers at ground breaking ceremonies Aug. 16 officially opening a \$3.5 million "fast pulse" nuclear reactor facility construction program at the Aberdeen Proving Grounds, Md.

The facility is being constructed by the Security Construction Co. Inc., of Richmond, Va., and is expected to be completed in 18 months, becoming operational in 1967.

The nuclear reactor will be patterned after the Oak Ridge National Laboratory for health physics research. It will be operated by the Ballistic Research Laboratories (BRL), under the direction of Dr. Hubart P. Yockey.

Upon completion, the facility will be used by military organizations and industrial contractors for research in the fields of high intensity radiation and testing. It will be one of seven sites located in the United States.

Colonel Charles D. Y. Ostrom, Jr., Commanding Officer, U.S. Army Ballistic Research Laboratories (BRL), was master of ceremonies at the ground breaking rites.